WINTER EGGS

BY

E. O. WATHEN.

A handbook on Utility Poultry Keeping embodying American intensive methods—with complete index.

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PREFACE.

THERE can be no two opinions as to the desirability of largely developing the poultry industry in this country, and the reform of the Irish egg trade shows what can be done by adopting a rational system of collection and marketing. But this little book deals with another aspect of the case, giving full details of the American "intensive" system of poultry rearing, which is now on its trial in this country, in the hope that it may lead to a large increase in production. It seems to be generally agreed that—apart from the production of pedigree stock and the taking of pupils—poultry farming on the ordinary English lines does not pay when considerable sums have to be expended on food, and a large area devoted to its practice. It is of course a most valuable accessory industry, regarded as a means of utilising certain forms of waste, and is sufficiently remunerative on a small scale. The American system enables an enormous reduction to be made in the space required, and claims to reduce the cost of production so that satisfactory profits can be made even when large quantities of food have to be bought. The author has made a careful theoretical and practical study of the subject, and the numerous poultry-keepers who desire to test the intensive system will find this book a thoroughly practical guide. But even if American methods are proved to be suitable for Britain, success in their application cannot be expected without constant supervision, and strict attention to detail.

J R. AINSWORTH-DAVIS.

Royal Agricultural College,
Cirencester,
January, 1914.

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WINTER EGGS.

CHAPTER I.

INTRODUCTORY.

Of late years both in the United States of America and in Canada great strides have been made in utility poultry culture.

The object of this book is: I. To help disseminate in England the information which America has acquired. II. To collect in a form handy for reference a number of data which it is hoped may prove useful to all classes of utility poultry keepers, no matter what system of keeping poultry they are following.

An endeavour has been made to give a fairly complete index, and a few blank pages have been left at the end to enable further index references, addresses, etc., to be written in as desired.

For those who wish to go in for intensive poultry keeping, by which is implied that one makes use of but little ground space and yet obtains the highest results, these American ideas are well worth consideration. The methods are equally applicable and advantageous, whether it be for the man with a diminutive backyard who keeps six hens in a coop 7 ft. by 3 ft. by 3 ft. high, or for the man who builds a shelter in the corner of his garden, some seven or eight feet square to hold twelve to eighteen fowls—up to the big man who has several houses each holding 500 or even 1,000 birds.

For this system no outside run is necessary, and the fowls often live permanently inside their houses, but yet remain perfectly healthy and contented.

This method of keeping poultry has come to us from America where it has been taken into general use; it is not, however, really absolutely new in England. We have all of us met people who though keeping but very few fowls were producing a far greater percentage of winter eggs than their richer neighbours. The reason is that many such small poultry-plant owners have long been working unconsciously on these intensive lines.

Given a man who will himself build a place for his fowls to live in and make improvements as experience may suggest, but has a very limited ground area available—given also a good hen-wife who takes an intelligent interest in her fowls—then the result may easily be that the fowls concerned will be kept very much on the lines here advocated, and this is what has happened in many cases.

The owners of such small yard poultry plants may naturally ask what is there new about these American ideas? I can only reply that when compared with the instructions I found laid down in the English poultry books I tried to learn from some six years back this American system is new, or at any rate different. On writing to an English expert for information about six years ago I was informed that exclusive of the sleeping house the fowls must have a run with a minimum allowance of 5½ square yards *per bird*, that is 49 square feet, but from America I have learnt that 49 square feet of round area suitably arranged will accommodate fourteen hens comfortably and keep them in perfect health.

HOW THESE NOTES CAME TO BE WRITTEN.

So far as I know, I was one of the first people in this country to keep fowls on this American system. The result has been that I have had much correspondence about it, and people quite unknown to me as well as acquaintances wrote to me for information on various points. Finally I had a lot of notes typewritten and these are now enlarged for publication.

The usual request I received was for something definite in the way of an opinion. There are few things one can answer exactly without knowing all the circumstances, *e.g.* hens all in full lay want far more and stronger food than if they are resting, etc., etc.

I have tried here to put down something definite, on most points for people to make their first start with, but I have also tried to explain the why and wherefore, as it is infinitely better for people to know the reason for anything and then build up their own rules and timetables to suit their surrounding circumstances, and the hours at which it is convenient to tend their fowls, etc.

What information I have been able to collect about poultry comes from many different sources, and I am grateful to all these sources. I must, however, particularly mention Mr. Philo's paper "The Poultry Review," a paper which deals also with farm work, and is published monthly at the Philo National Poultry Institute, Elmira, N.Y. It is edited by the Rev. W. W. Cox, and has several very able regular contributors. Very rarely does a number of this paper appear without some really interesting article on poultry and small holding farm work.

I am also much indebted to the following books, "Poultry for the Many," and "Diseases of Poultry" and the poultry paper "Eggs."

ADVICE TO BEGINNERS.

Begin with a few birds only, even if you intend eventually to work on a large scale. To learn the work you must do everything for the birds yourself and you should do everything most thoroughly and in the best way you can. If you keep 20 or 30 birds in a few coops you can easily fill in the whole day in looking after them and only half of the chickens they should breed.

When you feel that your venture is successful, and you see your way clearly, you can gradually increase operations—but do it gradually. There is a vast difference between looking after 30 or 250 fowls, and the moment you get in outside help your success depends on how other people choose to do their work. Commencing poultry keeping on a really large scale without considerable practical experience is perhaps one of the surest ways of losing money.

TIMETABLES.

As regards timetables I would urge everybody to draw up a timetable and work by it. After a little experimenting one should arrive at something which proves convenient, and fowls do like regularity in feeding hours; besides which if the person who usually does the work has to be away for some reason it is very convenient for him and the fowls if he has a complete timetable ready drawn up which he can hand over with the keys to who ever is doing his work.

CHAPTER II.

DESCRIPTION OF THE AMERICAN SYSTEM.

General Requirements of Fowls.

To enable hens to produce eggs to their full capacity, they require, good quality and suitable food—sufficient food—plenty of exercise—fresh air, but to be kept out of rain, wind and draughts. Fowls while in health do not suffer from cold (low temperature) such as we generally know it in England, provided they are out of the wind, rain and draughts. When the cold is severe enough to cause frost-bite to their combs then it requires consideration. Damp cold is of course more trying than dry cold. Sudden changes of temperature are bad for all animals.

Fowls also require an unlimited supply of good clean water—grit (preferably flint grit) which by the action of the gizzard takes the place of teeth—crushed oyster shell to supply the lime both for their own bones and for the egg-shells, good and suitable food was given as the first requirement and of course includes green food, but it is well to definitely add that a *daily* supply of green food is essential.

The above all holds good as regards the management of fowls, no matter what system or methods may be adopted.

Old Method of Keeping Poultry.

Of late years the usual method of keeping fowls has been to supply them with a small house to sleep in and an open-air run for the day time.

If the run is of soft earth it becomes boggy in wet weather, if of gravel, they cannot do much digging in it nor can food be buried in it. If the run is of grass, the grass soon gets worn off unless the run is very large; and further, a small grass run is apt to become very foul. The small sleeping house, generally a rather dark place, is usually only cleaned out at intervals of a month or far more. Thus on very wet days the fowls are reduced to sleeping or moping on their perches in these small smelly dark houses, should the weather remain bad, they can hardly be expected to remain healthy and continue making eggs. It is true that some few people provide scratching sheds to meet this difficulty of wet days. But to provide fowls with a sleeping house, a scratching house and a run means considerable expense and such housing becomes decidedly more expensive than what is described in these pages.

The American Point of View and Practice.

The above old method was formerly the usual one in America, but according to all accounts it is fast losing favour and giving place to this newer method, the difference being chiefly as regards housing. The laying hens being usually now provided with no run or separate sleeping house, but only a glorified scratching house which also contains their sleeping accommodation.

Main Eesentiale for Winter Egg Production.

(According to the American Poultry Men.)

To give the hen every chance of laying heavily during the winter she must of course have been hatched out during a suitable month, etc., etc., but apart from that part of the question, which is not under discussion here, there are certain points connected with housing, exercise and feeding (A, B and C) upon which most American poultry men now appear to be agreed. It is in these points that American poultry culture differs from the usual English practice, and I cannot but believe that all who have given the American system a fair trial must agree that it is the right one.

Housing.

(A). Fowls in their natural state do not lay many eggs during winter time. Therefore to get eggs at that season we must prevent winter conditions of weather from ever reaching the hens. Consequently hens should not be allowed out of doors, but should be kept inside houses where they are protected from wind, rain, cold and damp. To be healthy, these houses must have plenty of fresh air and light, allow of the sunshine getting at all parts inside, and they must be dry and be kept clean.

Exercise.

(B). During their natural egg-laying time, the spring and early summer, hens if left to themselves roam far and wide and take a great deal of exercise digging, etc., in search of food which they thus secure in plenty and great variety. Therefore for winter eggs we must provide deep dry litter in which to scatter a considerable portion of their daily food for the hens to dig out and so get sufficient exercise for health.

Feeding.

(C) I. Formerly soft food was generally advocated for the early morning—now the fowls have to dig their breakfast out of the litter in the form of grain and so warm themselves up, while the soft food is given at midday and by some people even late in the afternoon.

II. Nowadays quite half the volume of the fowls' rations is given in the form of bulky material such as bran and dried clover, because a large amount of bulky food has been proved desirable for health.

III. It is now realised that besides being valuable on account of their bulkiness, broad wheat bran and clover (fresh, dried or as ensilage) contain some of the most important food elements as regards the production of a large egg yield and of hatchable eggs, and these foodstuffs are now largely given both dry and moistened.

IV. A free use of sprouted oats as a foodstuff is now almost universal for poultry of all ages but especially for breeding pens as adding greatly to the hatchability of the eggs.

Large versus Small Flocks.

Though agreed as to the general management, the American poultrymen are divided into two schools as regards the number of fowls which should be kept together.

The Small Flock School.

These keep their fowls in lots of six to twelve hens in each coop. This method was originated by Mr. E. W. Philo, who in fact also first brought the public in the U.S.A. to appreciate the main essentials for winter eggs. This small coop system is suitable where the available capital is small or where it may be necessary to move the coops to another residence as they are very portable.

The small coops are much in favour with people having no ground except a small yard. This system is, however, also followed by some very big poultry men, who hold that the hens lay more eggs than if they were in large flocks, also that it much facilitates breeding arrangements, etc., and that sickness has less chance of spreading.

The Large Flock School.

The large flock school keep their fowls in houses that hold anything from 25 to 50 up to 500 or 1,000 and even more birds. These people hold that the large houses are a much cheaper form of housing (about

4s. 4d. per bird in England for a 100 bird house) than the small coop system (about 7s. 6d. per bird for a six bird coop), also that the labour is so greatly reduced in tending birds in large flocks that it more than compensates for the greater percentage of eggs which the small coop system might give them.

The Corning Egg Farm in New Jersey is one of the leading large flock farms. They have three laying houses for the supply of sterile eating eggs only, each house holding 1,500 pullets. The Corning Brothers say that the main difficulty they at first had to contend with in these big houses was the prevention of draughts, but in this they eventually succeeded.

The first requirement for complying with these main essentials for winter eggs is the provision of suitable houses.

Housing for Small Coop System.

As regards small coop work, it is as yet difficult to imagine anything much better than one of Mr. Philo's patterns called the adjustable coop (see Fig. 1). Described briefly, it is about 7 ft. long, 3 ft. wide, 3 ft. high. The roof slides and the coop is thus opened to get at the fowls. The roosting perch is fixed on to a small dropping board which is all removable from the coop so that the droppings may be easily cleaned off every morning. During the day time this dropping board can be stood on its side in the coop so as to take up less room.

The West or sleeping half of this coop has solid walls of wood as to the North, West and South. The East half of the coop has, on its North side a solid shutter which is closed in winter, on its East side a window, on its South side a muslin shutter which allows of light and ventilation. In hot weather both the North and South shutters can be opened leaving only wire netting, this allows of a free passage of air through the East half of the coop. Part of the roof also hinges up by which top ventilation can be arranged. This coop holds five or six fowls. In this wet English climate these coops should be raised well clear of the ground and must be provided with a boarded floor. A coop of this description ready made costs about £2 5s.

Housing for Large Flock System.

The general idea of all these houses (see diagram 2) is a building with solid walls on the North, East and West sides all draught-proof, and also as regards the joints between the walls and roof. The South side of the house is usually all open wire netting except for the bottom two feet which is wood. The wire netting has some form of muslin covered shutters to give more shelter when required.

These houses may be of any size. The usual allowance of floor space per bird is from 3¼ square feet in large houses up to 4 square feet per bird in a very small house. (In the larger houses the hens have practically more room to wander in so that the smaller allowance per hen suffices.)

A house for 25 birds might be 10 ft. square. A house for 100 birds is usually 20 ft. by 16 ft. In still larger houses the depth is generally kept at 16 ft. and the front is increased as necessary.

The cost of housing per hen decreases as the houses get larger.

Well equipped houses of good material including creosoting, etc., work out at present prices (April, 1913) about as follows:—

A	house	for	15	birds	...	8s. 11d.	per	bird.
,,	,,	,,	25	,,	...	7s. 7d.	,,	,,
,,	,,	,,	50	,,	...	5s. 2½d.	,,	,,
,,	,,	,,	100	,,	...	4s. 4d.	,,	,,
,,	,,	,,	200	,,	...	3s. 7½d.	,,	,,
,,	,,	,,	300	,,	...	3s. 4½d.	,,	,,

The saving gained by building larger houses now decreases steadily.

The above rates all include a wood floor raised well off the ground which is essential.

As a house for 50 birds is about the biggest house that people in a small way would require, and as in any case it is a convenient size to make a trial with, I will describe a suitable house for that number of birds in some detail.

For other sizes larger or smaller the same general arrangements would apply. If it is desired to give the fowls a small run to go out into during the summer this may be done, but it is not necessary and no food should ever be given in the run.

House for 50 *Birds.*

The best proportion of frontage to depth is about 5 to 4. I therefore suggest 14 ft. 3 in. by 11 ft. 3 in. as this size, but not smaller, would allow $3\frac{1}{4}$ sq. ft. per bird. For the heavy breeds the number of birds would have to be somewhat reduced.

Front, 14 ft. 3 in., depth, 11 ft. 3 in., height in front, 7 ft., at back, 5 ft., walls to be of $\frac{7}{8}$ in. wood, or at very least a full $\frac{3}{4}$ in. and tongued and grooved. The roof to be sloping, of wood tongued and grooved covered with felt of some sort.

The front of the house should be all openable except for a height of about 2 ft. along the bottom. All this open part is covered with 1 in. netting to keep the sparrows out. To close up this opening (about 14 ft. by 5 ft.) in the front, two rows of shutters are provided, one above the other. These shutters hinge at the top and open outwards so as to carry off rain or provide shade, they can also be propped right up so as not to interfere with the sun if so wanted.

These shutters consist of a wooden frame covered with common muslin. In very bad weather it might be desirable to close down all of these shutters, but light and air would still get into the house through the muslin.

This open front should in England always face South as we want all the sun we can get.

To prevent rain running in through the slit along the top of these hanging shutters, a long strip of felt or some such material, a few inches wide, should be securely nailed to the house, outside, just above the top of the shutter; this felt will lead any rain safely over the slit on to the shutters, whence it can run on. The muslin should be tacked on to the outer side of the shutter not the inner side, as this will keep the house drier. The top and sides of the muslin may be held in place by thin battens of wood laid along the edges, but there should be no batten along the lower side, as it would hold up the rain and give it time to soak through the muslin.

The muslin should be of a cheap open make, the closer woven and more expensive kinds are not nearly so good for the purpose.

In specially cold places it may be better to somewhat reduce the size of the open front, but the open part should never be less than ¼ the area of the front wall.

A good wood floor is required, and to ensure dryness the whole house should be raised well off the ground, preferably at least 8 inches so as to allow of terriers keeping the underneath clear of rats. Do not have a cement floor, they are usually damp.

Two long roosting perches will be required, these are fixed side by side on the same level all along the North wall, and say 2 ft. below the roof. Three or four inches below the perches a shelf about 30 inches wide is fixed, this shelf acts as the dropping board and catches all droppings while the birds are roosting. The remaining 2 ft. 6 ins. (about) of height under the dropping board allows of sufficient light for the fowls to be able to search for corn in the litter underneath.

The door of the house must be wide enough to admit a wheelbarrow. It is best placed about the centre of the West wall where it will not cause a draught on to the roosting perches, while if an additional inner wire netting door is provided, the solid door can be left open and a very airy South-West corner of the house is available for very hot days.

There is a further point which is well worth consideration though it has not been catered for in this description of a house, it is a question of putting up some sort of partition; it is not generally considered necessary, but several authorities strongly advocate that in every fowl house there should be at least one and perhaps two partitions (wood for 2 ft. up and netting above) so as to break the floor space up into two or three rooms, and that one of these compartments should contain earth 6 to 10 inches deep instead of litter. The idea is that fowls like some variety and enjoy wandering from room to room and and the change of digging in earth or litter as they may fancy.

Very recently I have seen an intensive house which had two doors, one at each side of the house, these doors were placed close up to the front end of the side walls. The extra expense was small, but the arrangement seemed a decided improvement. There was less chance of draughts near the roosting place, and in summer when the two wire netting doors were fixed, there was a greater window area, and the front part of the house was decidedly more airy than with one door only. Also such a house could be more easily partitioned if desired, so as to accommodate two distinct breeding pens.

I would suggest that anybody thinking of building a fowl house should read through the articles on drainage, extemporised fowl house, ventilation, etc., which appear later in the book.

Fowl Houses in Hot Climates.

In countries where severe winter weather is unknown, and a hot sun is the usual thing, it would be absurd to provide a house such as one would build in the North of England. Something much simpler suffices and is preferable. I understand that in climates such as Florida the following characteristics are often found.

Three or even all of the walls are simply wire netting. Muslin shutters for all the openings are not necessary, though some few may be useful. The roof may project somewhat to give more shade. Often a shelter of sacking is provided on three sides of the roosting perch, but sometimes there is no such shelter.

Where strong winds or driving rain occur the scratching litter is sometimes surrounded by walls 2 ft high, these walls being well back from below the outside edge of the roof, these provide a shelter for the birds they keep driving rain from the litter and prevent the litter from being blown away.

A good dropping board under the perches is absolutely necessary under all circumstances to prevent the house from becoming foul.

In short, a house must be designed suitable to the climate, and this is not difficult so long as one keeps in view the general objects to be attained.

Preparing the House for Occupation.

Having got the house up in position and facing South, it is well to examine all the walls, especially near the roosting perches, for draughts, and if any crevices are found, they should be puttied up or have calico, muslin or paper pasted over them; this is well worth doing as otherwise some draughty crevice may remain a continual cause of colds.

By way of getting a good start in the war against lice and mites I should now thoroughly spray all the inside of the house, the floor included also the nest boxes and all woodwork that will live in the house.

The nest boxes or trap nests are placed in position. The water fountain, grit, oyster shell and charcoal boxes, and the dry broad wheat, bran hopper should (in case all these are used) be all of them arranged on low tables or packing cases or hung on the walls about 2 ft. 6 in. above the floor boards so as to be well clear of the litter yet so arranged that the fowls can get at them comfortably.

The litter is now put down, first a one inch layer of sifted earth or sand and then a foot of straw. (The straw should not be cut up as the fowls will do that all too soon).

A dust bath should be arranged for.

Outline of the Daily Routine.

The house having been erected and prepared for occupation and the fowls put down, a short outline of a day's work is all that is required to complete this sketch of how this method is carried into practice.

One thing, however, must first be arranged, that is, to decide when the soft food meal is to be given. On page 7 in the "Feeding" part of the "Main Considerations for winter eggs" it has been pointed out why this soft feed should not be given in the morning. I believe the majority feed it at midday, but I know of cases where it is found preferable to feed it late in the afternoon.

To get on let us for the moment assume that the soft feed is to be given at midday. There are many other details in Chapter III. which ought to be carefully gone into before arranging one's timetable, especially as circumstances alter cases so much, therefore this timetable is only intended as an indiaction of what might be found suitable.

OUTLINE OF A DAY'S WORK.

7 or 8 or 9 a.m.

Shutters opened up according to weather.
Green food is put down.
Dropping board cleaned.
Water fountain cleaned and refilled.
Rake litter tidy and scatter a little grain.
Collect eggs.

1 or 1.30 p.m.

Soft food is given, the bulk of the day's grain is scattered in the litter, eggs are collected.

6 or 7 p.m.

Eggs collected, broody hens removed to or from the broody coop as necessary, some grain is scattered in the litter for next day's breakfast, shutters are closed down according to weather and doors locked.

[This is only intended as a sketchy outline, more detailed suggestions in the way of Time Tables are given later in the book.]

As regards this outline of a day's work just given, many people would say that green food must be given twice a day, and would also consider more visits necessary. On the other hand, many people who have to be away at their work all day would say that three or four visits per day would be quite impossible for them. For the latter I would point out that since Mr. Philo introduced his system, poultry keeping has been very largely taken up in America by working men, and with great success, though many are only able to give the fowls some 15 minutes in the morning and a visit in the evening, with a good clean up on Saturdays.

I understand that one large, successful, poultry farm has simplified its feeding down to two visits.

8 a.m.—Green food.

1.30 p.m.—Soft food is given. The whole day's corn ration is scattered about. The water fountain is refilled.

In this case the fowls at once eat up the wet mesh, and when that is digested they commence digging out the corn, and next morning continue the search to obtain their breakfast. I should add that this farm have their litter one foot deep. But, of course, on such a farm other visits are also made for egg collecting, cleaning, etc.

How Far Confinement is Necessary.

Opinions differ considerably as to whether the birds should sometimes be allowed out of their houses or not.

It has been clearly proved that fowls can be kept permanently in either houses or coops and never be let out, and yet grow up healthy and breed strong chickens.

Many people who have the space, arrange, especially for breeding pens a run for the birds to use in fine weather. Many who keep a few fowls in coops, release each coop in turn, on fine days for an hour or so, and find that the birds are so tame that they never wander far. On the other hand, some people hold that the birds lay better if kept always confined.

Opinions seem unanimous that when a lot of pullets ready to lay have been collected and placed in a laying house for the winter, they will lay better and more regularly if left undisturbed in the house at any rate until spring arrives.

When birds are taking their rest or moulting, it does not seem possible that being allowed out in a run in fine weather can be other than good for them.

When birds are kept in small coops in summer, if it can be arranged, it is certainly desirable to have a small open sided coop run attached even if it is only half the size of the coop, the roof covered with sacking for shade and the sides of wire netting only. This forms an extra room for the birds to wander in and get more fresh air, but all feeding should be inside the coop. Where the Philo pattern "adjustable coops" are used, by placing two coops side to side about four feet apart, and providing wire netting ends to connect the coops and also a roof; the space between the coops can easily be shut in and used as two small runs, one for each coop.

As regards chickens, there is no need to consider the question of disturbing egg production, so where space is available it seems better to let them out. One large farm practically turns them all out on open range from three months old until ready to lay.

Of course, in unreliable weather, all young chickens are better confined or with small runs only.

Chickens intended for market are better never let out of their coops. They will grow quicker and be more tender, but they must not be made to work too hard. All the above presumes the birds have suitable houses, and that feeding is done in the houses.

Health and Strength.

Where inbreeding is avoided and proper feeding and treatment are provided, the vitality and vigour of stock bred from birds kept on these American principles will in no way suffer.

As regards facts to prove this:—In America, under these new methods, a far greater proportion of chickens are now expected to grow to maturity than formerly.

Of a certain small flock of birds who have been kept on these lines for over ten generations, I can give the following particulars:—Of chickens who lived to be a week old—of about 120 chickens hatched last year only 6 or 8 died other than violent deaths (cats, etc.). Of about the same number hatched this year only 8 died. I must add that very few of these were hatched before March, but even so it was a very good record.

Advantages and Disadvantages.

Disadvantages of the American System.

Fowls are always apt to eat soft shelled eggs and among every flock of fowls there are often some laying such eggs. Under the old system where hens have a sleeping house and a run, the next boxes are generally in the sleeping house, in this case if soft shelled eggs are dropped the fowls are less likely to notice them as they do not frequent the house except at night and in bad weather. As egg eating is a very catching habit this is undoubtedly a serious disadvantage to the American system, but very much can be done by careful arrangements as to the sort of nest boxes used, keeping them dark, etc., and if trap nests are used the difficulty is easily overcome.

Another disadvantage to the American plan is that if the fowls are overfed, and especially if animal food is too lacking, the fowls are apt to idle about and may pick up the habit of feather pulling and eating. If this trouble occurs it has to be fought by removing the chief offenders, changing the food, and keeping them more hungry, and therefore more busy at work digging, but here the old system suffers in a similar way unless the runs are very large, but fowls wandering free over a farm very rarely suffer from this complaint.

As regards labour. In the case of the small coops the labour of looking after the fowls is considerably greater than when the fowls are kept in runs and their food is simply thrown on the ground.

Advantages of the American System.

Many of the advantages claimed have already been given. The fowls are saved from the effects of bad weather—also exercise which is so essential is ensured in all weathers, while this is rarely provided under the old system, the result of these two points being a greater egg yield.

Further advantages are:—

The loss of food owing to sparrows and other birds is prevented, and in some cases this loss is very considerable.

Sparrows can no longer bring lice into the flock. The fowls being shut up are less likely to contract sickness or vermin from other birds or infected ground, etc.

The ground does not become fouled as in the case of open runs.

The American type of house is light, airy and easily kept clean, while with runs the expense and trouble of fairly frequently shifting the houses and runs to fresh ground is incurred, besides which more ground may not be available.

As regards expense, where fowls under the old system are provided with a scratching house as well as a sleeping house and wire netted run, the balance of economy is decidedly against the old system.

As regards labour and convenience. In the case of the large flock houses, the balance is altogether in favour of the American system. The attendant can look after far more birds in less time, and he does the work under cover and comfortably.

Definition of Intensive Poultry Keeping.

As already stated the American ideas described in this book have taken firm root in England under the name of intensive poultry keeping. further, as soon as these American methods have come into general use in England the word intensive will disappear as no longer necessary.

Meanwhile I am told that I ought to give some short definition of this intensive system because so many people imagine that the beginning and ending of it is the keeping of the birds locked up, either five or six in a birdcage as they call it, or 50 of them in a house 12 feet square.

The American intensive system means far more than that, and, further, strict confinement is not an essential feature of the system.

Intensive methods in no way preclude fowls from being allowed out in a run during fine weather, while for breeding stock, this is quite a common practice when the ground is available, but experience has proved that with proper care and housing, an outside run is not necessary, even for breeding stock, while for birds employed in the manufacture of winter market eggs the general experience is that they produce considerably more eggs if kept altogether confined, at any rate, until the winter is over.

As a definition, the following may suffice as giving an example of what is and what is not intensive work.

Last winter, during a spell of fine weather, I visited a well known Exhibition Poultry Farm, where the intention evidently was to do the birds well and not spare expense. Each pen was provided with a large grass run, also a small sleeping house, also a roomy scratching shed. But the scratching shed was draughty, and, being low, it was somewhat dark and the sun could not shine freely into it, the litter was about one or two inches deep on a natural earth floor, the evening grain was scattered on some bare earth near by the house, and the arrangements generally were not such as to reduce the labour of looking after the birds. Further, as regards food, I found that the wet mash given to these fowls consisted of about 25 per cent. sharps, the remainder being biscuit meal, Sussex ground oats, and such like meals.

Had the scratching shed been sunny, free from draughts, provided with a dry raised floor, and with deep litter, had all the grain been fed in the litter, and had the mash contained more bulky ingredients, I should certainly have considered that intensive methods were being followed. As things were, however, it was clear that intensive methods were not in vogue.

This visit brought home to me very strongly the advantages of the American methods, both as regards economy and efficiency.

A Caution.

As already pointed out, intensive poultry keeping does not mean locking up fowls or chickens and then neglecting them.

I have several times seen this being done; birds shut up with an insufficient supply of ventilation, water and litter, etc.; with soft food lying about, and everything filthy.

Such methods lead to nothing but disaster, and bring unmerited abuse to the intensive system.

Where, from one reason or another, people cannot arrange for their fowls to be properly cared for, they had far better leave the intensive system alone and allow their birds as free range as possible; even if it means their sleeping in a box with a piece of oilcloth over it, they then, at any rate have some chance of fending for themselves.

Brief History of the Present Day American System.

A brief history of the intensive or present day American method of keeping poultry may, I think, be of interest. I believe the following to be the sequence of events which gave us the system.

Mr. E. W. Philo, now living at Elmira, in New York State, had for many years been very interested in poultry, especially in building up a good strain and in trying to improve the methods of feeding and management generally. He discovered, or at any rate brought to light, the fact that neither a hen nor a heated foster mother are necessary for chickens even when first taken from the incubator, but that a most simple device in the form of a box with a special though simple covering will rear chickens practically as well as a hen, and far better than the average hot brooder. This discovery has, of course, been of the greatest value to poultry keepers. Another point which Mr. Philo brought forward, though it does not sound so wonderful as the cold brooder, is nevertheless of great importance, namely, the use of muslin as a covering for window frames, shutters and other openings. The muslin allowing both sunlight and fresh air to get into the fowl house while preventing draughts and allowing the foul air to get away.

The advantages of a free use of dry wheat bran (when it can be bought cheaply), of short cut dried clover, of sprouted oats, and of burying *all* corn in deep dry scratching litter, are all of them valuable aids which have become known, at any rate to most of us, through the efforts of Mr. Philo.

Well, to get on with the history, I think it was in 1906 or 1907. Mr. Philo was changing to another house; he had a lot of birds, and some of these he wished to keep near him at his private residence; he was wondering how he could house them until he got sufficient fowl houses built at his new residence. On seeing some old piano cases, it struck him that with the aid of some felt for a top cover, some muslin for windows, and a little carpentering, each of these piano packing cases might be made to accommodate a few fowls. He carried out this idea, intending it to be a very temporary arrangement. However, for some months after Mr. Philo was very busy, and these fowls remained in their piano cases, and to Mr. Philo's surprise he found that these closely confined hens laid more eggs and generally "did" better than the birds with ordinary housing. This started him to work on devising a good and economical form of small coop, something to hold from six to twelve fowls, and in this he succeeded most thoroughly. (See Figures 1 and 3.)

Thus we arrived at the Philo system, *i.e.*, small flocks in small coops, fresh air but no draughts, deep litter, and all corn stuff buried so as to give exercise, and plenty of light in the coops. This Philo system was, and is, largely practised in the U.S.A. A most important part of the system was considered to be the keeping of the birds in very small flocks (six to twelve birds).

I know of two people besides myself who were following the Philo system in England in 1910, I have not heard their experiences, but mine were that the fowls did most excellently well in these small coops (less than three feet in height), but many times during that and the following soaking wet winters did I want to build coops six feet high for my fowls so that I might get inside and tend the birds while out of the wet, but from the financial point of view it was, of course, absurd to think of building a coop six feet high to house six fowls.

New York State has, I imagine, much more of a continental climate than England, so that over there they are not so much troubled with wet as we are in England, but even so both in the U.S.A. and in Canada they set to work experimenting further, and arrived at the fact that even though fowls may not lay so many eggs as when kept in small flocks of six or twelve birds, still it is (at any rate for large numbers of birds) far more profitable to keep fowls in houses capable of accommodating 50, 100, or 500, or even more birds, rather than in small coops.

The ratio of eggs produced may possibly be considerably less with the large flock system, but the time and labour required for working the large houses is, of course, infinitely less than with small coops.

It is claimed for the small coops system that one man can look after 360 hens, while with the large flock system one man can tend four times that number, and even more.

These houses for the large flock system have in their design and arrangements much which has been taken from the Philo system, and I believe that as regards feeding and management, nothing better than Philo's system has yet been devised, so that altogether we may describe the large flock intensive system we now have in England as being the Philo system modified so as to allow of large houses. This means economy in housing, economy in labour, and more comfort for the man in charge of the fowls. Philo coops, however, will long remain in use for the rearing of chickens and for small poultry plants. Most excellent work can be done with these coops in the smallest yard. For "eating eggs" cocks are unnecessary and undesirable, and with no cock crowing, you neighbours can have nothing to complain of.

As regards the history of this intensive system in England, the thanks of poultry keepers are due to Mr. Randolph Meech for having made it known over here. Very early in 1911 he heard of a few people in England running Philo coops; these he immediately visited, collected what information he could and started experimenting on his own account. That summer, 1911, he went to the U.S.A. to investigate. In 1912 he again went to America, and has given us in the poultry magazine "Eggs," the cream of all that he picked up while touring round many of the chief poultry farms of the U.S.A. and Canada. Mr. Randolph Meech has also himself experimented on a very large scale, and the further information he has thus acquired has been freely imparted to English poultry keepers.

To those who would like to watch the progress of this intensive poultry work in England, I would strongly recommend their subscribing to "Eggs," the weekly magazine of the Intensive Poultry League, 4/6 per annum, post free, procurable from The Editor, "Eggs," Hamworthy Junction, Poole.

Since writing the above, I have heard that we are indebted to Mr. Charles Cyphers, of Buffalo, U.S.A., for having originated many of the ideas now in general practice in intensive poultry keeping.

CHAPTER III.

CLEANLINESS—EXERCISE—WATER—FEEDING—TIME-TABLES.

Cleanliness.

THIS is a matter of the first importance, especially in England, where we have so little sun to do the work for us, but even so, very many English poultry houses do not allow of the sun getting in at all, although he is the greatest cleanser. From this point of view, all windows should be deep rather than wide to allow of the sunshine travelling over all parts. For the sake of cleanliness, a dropping board should be fixed under all roosting perches. If this board is dusted over with earth, it much facilitates the scraping off of the droppings.

The dropping board should be cleaned every day, the scrapings all being removed away from the house. So long as the litter is absolutely dry, the droppings falling into it during the day will do no harm as they will soon dry up. Of course, there is a limit to this, and the litter has to be changed occasionally.

The water fountain and all troughs should be cleaned daily (a brush is useful for this) and they should be scalded once a week.

Lice and mites must be guarded against.

Exercise.

Is all important for health, and therefore for eggs. Therefore all food that is suitable for the purpose should be buried in the litter, but no food that is liable to turn sour or decompose.

Thus all grains and kibbled grains should be buried or scattered in deep dry litter, but all soft food, dry mashes, vegetables, green stuff should be fed in troughs or on box lids, etc. Many people to arrive at this, put down such food on boards, etc., and leave it down for about ten minutes during which time the birds eat voraciously—the boards and remaining food being then removed.

Water.

Eggs consist so largely of water that should the water supply run dry the manufacture of eggs ceases immediately.

The pureness of the water fowls are allowed to drink is often not sufficiently considered, for germs in the drinking water may easily get through into the eggs. Clean water should be before the fowls always, they drink frequently and at all sorts of hours, and they will drink much more freely if the water is cool and clean.

If kept in open troughs the water should be changed twice a day in winter and oftener in summer. If kept in an automatic fountain, one change a day suffices except in very hot weather.

Drinking troughs and fountains should be placed well above the litter to avoid fouling. A table, shelf or box 2½ ft. high is convenient.

Drinking vessels should be cleaned once a day, (this is easiest done with a fairly stiff brush) and they with all other feeding troughs, should be scalded once a week.

Automatic fountains are so difficult to conveniently keep clean, that they are undesirable unless they can be opened up from the top to clean out thoroughly as in the "top filler" fountain described later in these notes. (See Fig. 4.)

In hot weather three fowls will often drink a pint of water between them daily.

In winter when water cans are frozen, do not try to chop out the ice or you may damage the vessel. Turn the tin upside down and pour boiling water on it, the ice will then fall out easily.

On cold winter days fowls much like warm water to drink.

General Principles of Feeding.

The general principles of feeding for this intensive system.

1. To keep the birds perfectly healthy by giving them suitable and best quality foodstuffs and plenty of exercise, and for this reason all corn is scattered in deep dry litter.

2. To get the birds to eat as much as possible late in the day so as to get through the night comfortably.

3. To provide corn which they may dig out as soon as they wake up in the morning, they are thus saved from fasting and the exercise starts the circulation to work freely.

4. During the day at intervals to supply a small quantity of scratching food to keep them occupied digging, this supply must be meagre or difficult to dig out so as to keep them sufficiently hungry to be willing to continue digging for corn off and on all day long. Darri and millet are useful for part of the day feeding, being very small grains they give plenty of work to get them all out of the litter.

5. Green food at least once a day in winter and at least twice a day in summer.

6. To ensure hatchable eggs and prevent indigestion among the hens, quite a half of their food must be of a bulky nature such as bran or dried clover.

7. Water, grit and oyster shell must always be available for the fowls.

Green Food.

Fowls kept without green food cannot remain healthy. Cooked green food will not altogether replace raw green food. Fowls should have at least the following amount of it:—As much as they can eat at a time once a day in winter and twice a day in hot weather.

As to a definite quantity:—Of oats sprouted to ½ or 1 inch long Mr. Philo says one ounce daily for each hen until they are accustomed to them, when the amount can be doubled or even more in case no green lawn clippings, etc., are available.

Another leading authority "gives his breeding stock 8 cubic inches daily of sprouted oats, the sprouts being as near one inch long as possible, the length of the root being immaterial. He finds this ample as the only green food throughout the winter, I should perhaps add that quite 40 per cent. by measure of his wet mash is dried clover. This same authority considers one average cabbage per week sufficient green food for a pen of 15 to 20 birds, he allows they might like more, but it would not be really necessary."

The young shoots of growing grass is perhaps the green food fowls are most fond of. Lawn trimmings from a mowing machine are excellent, and these can safely be given to chickens two weeks old.

Sprouted oats are specially good, practically any garden produce is good as also swedes, turnips, and mangolds.

Though onions are especially wholesome it should be remembered these give a flavour to the eggs.

No vegetable matter that has gone sour should ever be fed to poultry.

It is undesirable that any green food should be left in the litter to decompose, decaying matter is most unwholesome, for this reason some people chop the green food small and feed it to the fowls on boards, leaving it down for a full ten minutes or as long as the birds eat freely.

Some people hang, rather high up, a cabbage or a beetroot and leave it there for the fowls to jump at; the fowls can certainly feed more comfortably off a whole or even a half cabbage than off loose leaves, as the weight of the former enables them to break off the small pieces they want.

As a means of working off outside and loose leaves I made some bags (about 20 ins. by 15 ins.) of one inch wire netting and hung these in the house with cabbage leaves, etc. inside, they answered very well.

Rape is an excellent green food for fowls, it grows freely and gives the yolks a dark colour. Thousand headed kale is also a good green food.

For winter use field or cattle cabbage is very suitable as it resists the frost.

Do not give vegetables while in a frozen state to poultry.

It is often worth while keeping a small reserve of mangolds, these can be kept buried in a pie and will come in very useful when green foods run out.

Sprouted Oats.

Sprouting a grain alters its character as a food, and brings all the nutriment into the best form for quick assimilation by the fowl.

Sprouted oats are a most valuable food for securing a plentiful supply of, and really hatchable, eggs. No doubt when grown in the earth they are at their best as containing more salts, but this would generally be difficult to arrange; it therefore seems best to supplement the sprouted oats by also using a little garden green stuff when available, and sprouting the oats as follows.

Procure two or three boxes, all the same size, knock out the bottom and replace by battens nailed across 1/16 or 1/8 inch apart or nail on a bottom of perforated zinc, also fix two battens underneath all to keep the bottom off the ground and so allow the water to drain away.

For about 30 fowls I found that a convenient size for the boxes was 15 ins long, 11 ins. wide, 12 ins. deep. If procurable small nail kegs with holes in the bottom answer very well.

Having these boxes ready, I soaked from 3 to 5 lbs. of whole oats for from 12 to 18 hours in water in a bucket (warm water for choice, but not hot). After soaking, the oats are poured into one of the boxes.

Next day the oats are well sprinkled with a watering can, (in winter use tepid water, and ½ to ⅔ pints is sufficient) they are then poured into another box and so on daily keeping the oats always thoroughly damp which for the first week will mean two waterings daily, but one change of box will suffice.

By having three boxes, two lots of sprouting oats can be kept going, and a continuous supply so arranged. These boxes should in winter be kept in some fairly warm place.

The sprouting oats are ready for feeding as soon as the sprouts are ½ inch long (about one week's growth in average weather). They have much more nutriment in them when from ½ to 1½ inches long than when 3 inches long.

Oats, short sprouted, do not look much like green food, but I have kept fowls for months with no other green food, they remained most healthy and their eggs hatched out well.

On occasions the oats have been soaked for as long as 24 hours and apparently no harm followed. When the oats are first poured from the bucket into the box it is perhaps better to leave them undisturbed in the box (except as to damping) for two days or even more, as they seem to start sweating quicker, but as soon as they feel warm when the hand is pushed into them the daily pouring from one box to another should commence.

If the sprouted oats are for young chickens under three weeks old, it is safer not to let them have the hulls of the oats. In this case procure one or more shallow boxes or trays, bore holes or knock out the bottom and replace with battens ⅛ inch apart, and lay a piece of sacking on them. As soon as the oats start sprouting spread them in these trays to a depth of 2 inches. The oats now require nothing more to be done to them beyond watering. When the sprouts are 2 inches long the stalks may be cut and clipped small for the chicks, the sod can be fed in lumps to the grown fowls.

In the course of sprouting oats increase in weight from three to five times, (1 lb. gives 3 lbs. when sprouted to half an inch long). Almost all kinds of grain may be sprouted, but oats seem the most satisfactory.

Be sure you do not buy clipped oats or kiln dried oats for this purpose, as they would not sprout, and last year's seed will give you much better results than older oats, as the vitality of the oat germ weakens.

For those who have the facilities it would be worth while arranging a thick wood packing case into a cupboard, arrange trays to rest on battens nailed on each side, have a lamp at the bottom and a zinc tray to catch the drip placed over the lamp, the ventilation is what will give most trouble to provide for without allowing all the heat to escape.

Mr. C. N. Perkins of New Jersey states that the water he uses for the first soaking is as hot as the hand can comfortably bear. He soaks for 24 hours. He keeps the oats in a temperature not under 50 degrees and hotter for quick growth. He waters twice a day for the first week or ten days, and after that once a day, the water should be poured on gently from a watering can. The water should be as warm as the hand can comfortably bear it. Boiling water at any time would scald and spoil all sprouting. On the fourth, seventh and tenth days once each day instead of warm he uses quite cold water for watering, this occasional change to cold water seems to give new lige, and more rapid growth will be noted almost immediately after. Proper watering will materially aid rapid growth.

Mouldy Sprouted Oats.

When sprouting oats they sometimes, especially in warm weather, turn mouldy and smell sour. To prevent this Mr. R. Meech gives in a late number of "Eggs" the following recipe which originated with Dr. Pearl of the Maine College, U.S.A.

"Utilize one pint of commercial formaldehyde to every 50 gallons of water. Soak the oats in this preparation for some 20 to 30 minutes, subsequently thoroughly rinsing the oats with clean water and then sprouting in the usual way."

Dry and Wet Mashes Compared.

These are mixtures of meals, bran, clover, etc. The controversy still continues as to which method, dry or wet, is the best. The following may help the beginner to form an opinion as to which suits his requirements the best.

Mashes may be given either absolutely dry or moistened (with hot liquid) so as to arrive at a crumbly state or they may be cooked. In no case should a mash be given in a sloppy or pasty state, it should be crumbly.

The dry mash—

This gives no trouble to prepare and little to feed. It may be given at meal times or fed from a hopper. The hopper may be always available for the fowls to feed from or it may be only put down for part of the day. In some cases a large hopper is used which only requires filling once a week. Thus the great advantage of dry feeding is that it greatly reduces labour, and is very convenient where fowls have to be left many hours without attention. Dry mash feeders often also claim that their fowls never suffer from diarrhea, but if a wet mash is properly blended and cooked and is not given too moist it should be more digestible and less likely to cause diarrhœa than a dry mash.

The moistened mash. This is more quickly digested and is often more freely eaten by fowls than a dry mash. Its chief advantage over a dry mash is that it enables you to get the fowls to consume far more dried clover and such like foods than if you used a dry mash. It has the disadvantage of giving more trouble to prepare and feed.

The cooked mash. This has all the advantages and disadvantages of the moistened mash intensified, but it also has the great advantage of economy. The meals, etc., swell so much in cooking that less than two-thirds of the materials necessary for a dry or moistened mash suffices when given as a cooked mash.

When to Feed the Mash.

Do not feed the mash in the morning, especially in winter, as the birds having filled themselves would stand about instead of exercising and so getting warmed up. Giving it just before dusk has good points in that the birds can be kept fairly hungry and at work all day, but if it can be so arranged it is decidedly preferable that when the fowls go to roost their crops should be filled with hard grain which will take longer to digest and so last them better through the night than soft food, which would more quickly digest. (The fowl's gizzard continues to work while it is asleep). Thus on the whole it seems best to give the soft food at midday, but if doing so is found to interfere too much with their taking exercise the only thing is, at any rate for a time, to alter the hour to the late afternoon.

Mixing Wet Mashes.

Wet mashes may be either just moistened so as to arrive at a crumbly state and then fed at once, or they may be cooked. A cooked mash may be either really cooked over a fire or a sufficient quantity of boiling liquid may be stirred into the dry mixture to make it sloppy, a cover put on to keep in the heat and the whole be allowed to steam for an hour at the least, (three hours is better) by which time the meals, etc., will have swollen and taken up all the liquid. In making a moistened mash it should be remembered, that maize meal and dry clover are the ingredients most improved by the hot liquid, also that for chickens it is essential that all the clover should have been thoroughly wetted so as to soften all the stalks, thus for a moistened mash it is best to keep back all or most of the bran: thoroughly wet the remainder and then dry off with the bran. It saves much time if you experiment and arrange for a measure, which will enable you to at once pour in the exact amount of liquid to give good results.

The hotter the liquid when poured on the more good it will do. The salt should be first dissolved in the liquid so as to distribute it evenly. In mixing a cooked mash it is also advisable to keep back the bran and sometimes some of the meals also for drying off, as it is important that no mash should be fed to poultry until it has been got to a crumbly state. A wet mash should be such that if some of it be taken up and squeezed in the hands and the hands be then brushed together all the mash will come away leaving the hands clear of it. If a cooked mash is being made without a fire a sack placed around the vessel and another over the cover will do much to keep in the heat.

Dry Mashes.

These are usually made of similar ingredients as wet mashes. As a rule fowls will not feed freely of a dry mash containing much short cut dried clover, so it is usual to reduce the clover and increase the bran, but an endeavour should be made to get them to eat more clover by gradually increasing it.

The proportion of bran should also depend on whether the mash is kept in a hopper and available all day, or whether it is only available half the day, or whether it is only put down once a day for 20 or 30 minutes for the fowls to make a meal. In the last case the mash should be of full strength as to the meal stuffs, while if it is to be available for feeding all day long then the bran should be increased until the mash becomes a sort of extra nutritious dry bran. There is no fear of the fowls eating too much bran or clover so long as they continue digging all day in the litter for grain, but if they give up digging then the dry mash must be weakened in meal stuffs or left before them for a shorter period only.

Mixing the Dry Ingredients.

Some people mix a bin full of the dry ingredients, while others keep the ingredients separate and take some of each as they require them when they are preparing a feed. In the first case it is more convenient to work by weight while mixing the ingredients, and in the latter by measure.

To arrive at any accuracy by measure, the box or cup that is used as a measure should not be scooped into a sack full of compressed meal, but first loosen some of the meal in the sack or bin and then scoop it out with the measure and strike the measure off level.

Working by weight gives far more accuracy than by measure, but with a little practice the latter is sufficiently accurate and sometimes more convenient, but unless one also knows what weights one is using, one is rather working in the dark.

For dry mashes it is certainly simpler to mix all the ingredients in bulk.

For wetted mashes perhaps the simplest way is to mix all the ingredients in bulk except the bran, which it is convenient to have separate for drying off.

As a very rough guide for converting weights into measures, it may be taken that:—

1 quart of Sussex ground oats weighs	1 lb.
1 quart of maize meal	1½ lbs.
1 quart of middlings	1 lb.
1 quart of broad bran	8 oz.
1 quart of short cut dried clover ...	4 oz.
1 quart of barley meal	1 lb.

Mixtures for Mashes.

The following mash mixtures are based on those in general use in America, but contain rather more ground oats and rather less maize meal.

If either skimmed or separated milk or stock were available for wetting the mash, it would often be preferable to omit the meat meal from the mixture; the milk is more digestible and for practical purposes would take the place of the meat to balance up the mash, but to have this effect at least one pint of milk must be added to each pound of dry mixture. For the dry mixture to be able to take up so much liquid it would have to be a cooked mash, *i.e.*, have time to steam and swell, and if the liquid were boiling and sufficient time allowed more than one pint of milk could be taken up by each pound of dry stuff.

If milk were not available for the "chickens mash four to eight weeks old" they should be given fresh raw lean meat separate to the mash.

For fowls unaccustomed to clover in their mash, it would be well to start with half the amount of clover mentioned and gradually increase the proportion as they got used to it; this also holds good as regards the chickens from four to eight weeks old.

Those who would prefer to use less maize might give half the quantity and make up with barley meal. Barley meal has a fairly good albuminoid ratio, and also contains much fibre, so that its use should be advantageous. I have left it out to save complicating the mixture and also because it does not seem to be much used in America. Personally, I have used much barley meal and have found it give good results. When fresh green clover clippings are available they would be preferable to use in the mash instead of the dried clover.

These mashes are arranged with the idea of very little or no maize or buckwheat being used in the grain feeding. These may be used as either dry or wet mashes, but if used dry the clover should be reduced at first until the birds eat it freely, more bran being added if necessary.

The salt must not be forgotten.

Proportions for Mash Mixtures.

	Summer (very hot weather)	Winter (very severe weather)	Forcing for market eggs.	Final strength of fattening mash.	Chickens 4 to 8 weeks old.	Forcing chickens 8 weeks old to early maturity.
	lb.	lb.	lb.	lb.	lb.	lb.
Ground Oats ..	3	4	3	4	2	3
Ground Maize ..	2	4	2	6	—	2
Wheat Middlings	—	2	2	2	2	—
Broad Wheat Bran	2	2	1	1	2	1
Short Cut Dried Clover or Clover Meal	2	2	1½	½	¾ to 1½	1½
Best Meat Meal ..	1	1	1½	—	—	1
Linseed Meal ..	—	—	—	½	—	—
Parts by measure scooped out of the bin which roughly approximate the above.						
Ground Oats ..	3	4	3	4	2	3
Ground Maize ..	1⅓	2⅔	1⅓	4	—	1⅓
Middlings.. ..	—	2	2	2	2	—
Bran	4	4	2	2	4	2
Clover	8	8	6	2	3 to 6	6
Meat Meal ..	¾	¾	1¼	—	—	¾
Linseed	—	—	—	½	—	—

Do not forget to add the salt.

Cotton Seed Meal.

Cotton seed meal is much used for mashes in the Southern States of the U.S.A. I tried it for several months as part of a dry mash, and the hens did well on it. At first the hens did not like it, but on reducing the amount of cotton seed and then gradually increasing it they took to it very kindly. The proportions I used varied but were about as follows:—

Ground oats, 2 lbs., maize meal, 1 lb., cotton seed cake powdered, 1 lb., bran, 2 to 3 lbs.

This dry mash with wheat and oats as the grain mixture gives a well balanced ration, and meat meal becomes quite unnecessary.

Cotton seed is so strong in albuminoids that it should not be fed much more freely than as above.

Malt Culms.

Malt culms or malt dust contain much of the albuminoids; they form a good, and in England, very economical food for poultry. I have never used them myself so I asked Mr. Randolph Meech, who makes a speciality of preparing this food into a bulk mash. to give a suggestion for a mash mixture based on these malt culms.

He suggests an equal proportion by weight of malt dust, clover meal or short cut clover, and bran. This should be well steamed, or better cooked, and then dried off with one-third to half the quantity of laying meal or ground oats or middlings.

Biscuit Meal.

When good, it forms an excellent food, but no better than the mashes one can mix one's self.

One is entirely in the hands of the manufacturer as to the contents, and the meat especially is not always above suspicion.

For the poultry man there is always the temptation to buy the cheapest biscuit meal one can find, and therein lies the temptation to the manufacturer to put into the biscuit the cheapest stuff be can procure.

Personally I like knowing exactly what the fowls are feeding on; this is generally not possible with biscuit meat, also as the meat is usually mixed in with it, one is unable to regulate the amount of animal food. So far as I have seen feeding with biscuit meal is not economical nor is it sufficiently bulky.

Dry Bran.

The Philo system book strongly advocates that dry broad wheat bran should always be before the fowls. I followed this and found it to work well, except that in some cases the fowls got so fond of it that they would not trouble to dig out the corn buried for them after which it seemed better to keep them a good part of the day without their bran box.

Good broad bran is too expensive to be able to use it so freely as they can in America.

Feeding dry bran very freely certainly has the following advantages.

1. The fowls are very unlikely ever to suffer from indigestion.
2. Their eggs are more likely to hatch out into strong chickens.

Animal Food.

Mr. Philo strongly recommends the use of milk, either sweet or sour, but he says "good results may be obtained without the use of either lean beef or milk when plenty of bran, green food and sprouted oats are provided."

Skimmed milk, butter milk and separated milk, are practically as useful as whole milk for breeding stock and they are sometimes better.

Dried granulated meal or meat meal is good if wholesome, and it is a convenient food to give, but one is so entirely in the hands of the manufacturer as to what it is made of.

Green cut bone increases the number of eggs, but renders them less hatchable. Where sterile eggs are wanted and the hens are to be killed off there is no harm in using it, the maximum ration is, I believe, half ounce daily per hen, and then only while she is in full lay.

The least injurious way of forcing hens for eggs is to give them plenty of green food and a good ration of lean meat.

Fowls that are being fattened do not require meat.

Fish heads and offal boiled up make excellent stock for mixing wet mashes, but if too liberally used it will flavour the eggs.

Bullocks hearts sometimes form an economical way of giving meat.

In some cases it is convenient to give all the fowls a meat feed twice a week, one ounce per hen for each feed is about right as a rough rule, that is 2 oz. per week.

It often much helps a breeding cockerel to keep in condition if given this feed of meat as above.

Fowls must not be given too much animal food, or it will seriously upset the kidneys and liver. Experiments have been made giving hens unlimited animal food by placing a hopper full of granulated meat so as to be always available. This has usually resulted in a greatly increased output of eggs for a short period after which the hens generally broke down and laid far worse than before.

The eggs laid under this meat diet were generally fertilised to some extent, but the germs were weak and only a small percentage developed into chickens. The chickens that did hatch were very difficult to raise.

As regards milk, there need be no fear of overfeeding this in any form.

It is quite impossible to say anything definite as to the exact amount of animal food that is good for fowls —it all depends on their diet as a whole, also on the number of eggs they are manufacturing. It is well worth giving half an hour to the article on "Chemical Value of Food." Once this article has been mastered you can yourself answer all questions as to the amount of meat it will be desirable to give in each case.

Unfertile Eggs.

Mr. Philo says that "in nine cases out of ten unfertile eggs are due to a lack of food containing protein (albuminoids) such as is found in clover and alfafa." A plentiful supply of dry broadwheat bran and of sprouted oats to the breeding pen also undoubtedly much helps to secure hatchable eggs. If the food is too concentrated, *i.e.*, not sufficiently bulky, the resulting chicks are generally weaklings.

Salt.

Salt is very desirable and should be added to mashes in the same proportion as to ones own food. For wet mashes it is best dissolved in the hot liquid before pouring on to the meal. For dry mashes the salt must be very dry so as to give more chance of mixing it well up with the meal as too big a dose of salt is not good for a fowl.

About one teaspoon of salt piled up to one quart of the dry mixture is the proportion.

The U.S.A. experimental farms have carefully gone into the question of salt for poultry. They consider it essential for health especially after the chickens are two or three months old. During one winter experiment the hens fed with a salted mash laid nearly twice as many eggs as the same number kept under similar conditions except that no salt was mixed in their food. The experiment was carried out with gradually increasing doses till it reached nearly half a pint daily for 100 fowls. When this amount was reached slight diarrhœa ensued, but it disappeared on reducing the amount. The experiments finally proved that for fowls 5 ozs. of salt can be safely mixed with every 100 lbs. of mash food. (The information about this experiment is taken from "The Poultry Review.")

The above works out at about 1 lb. of salt to 100 lbs. of the dry mixture.

Mustard.

A few years back Captain R. R. Allen of Sawbridgeworth, Herts., experimented largely as to giving mustard to fowls, especially during winter. To put it shortly, the mustard was most favourably reported on. It gave none of the bad results of cayenne pepper and spices even to post mortem examination. The birds were more healthy and laid more eggs than the non-mustard fed birds. The Allen Poultry Company supply without any charge a pamphlet giving the full data arrived at by these experiments. Several of the large American poultry farms, Cornings among them, adopted mustard feeding and speak very highly of the results.

The daily ration of ordinary household mustard is one teaspoonful to six hens. When the coarser grades, *i.e.* poultry mustards are used the daily ration is considerably increased.

Sussex Ground Oats.

Or oats ground in the Sussex or Kentish fashion. This means that the hull has not been removed as an offal, but that the hull and grain have been ground up together into a meal. This is one of the most valuable ingredients for mashes dry or wet.

Table Scraps.

It is very bad economy to allow of many table scraps because fowls are kept. In a well ordered household scraps are very few, and almost a neligible quantity as regards being of use for fowls where many are kept. For the family man who only keeps 6 or 12 hens in his backyard table scraps are, however, well worth consideration. There are always some outside leaves of cabbages, potatoe peelings, waste pieces of bread and bones from the stock pot. The bones should be given to the fowls to pick clean. The remaining scraps are best put through a mincing machine and then mixed with the mash thus effecting economy in Sussex ground oats, etc. Table scraps must, however, be fed in moderation as regards meat and fatty stuffs or the fowls will suffer in health. Never use anything that has become tainted or sour.

Remarks on Grains Generally.

Feeding on grain only with no mash is not desirable for following reasons. It is expensive, it is not a sufficiently bulky food, it becomes difficult not to give them too much starch. Some grain in their diet is essential as soft food only would not properly exercise their digestive organs. In no case should any grain be given to poultry which is not absolutely sweet and sound.

For breeding stock it pays to give the most suitable grains, whatever the price almost.

Stock kept for market eggs only must submit to some economy in the selection of their grain food, but not as to quality of it; the grain must be sound, and not all of it too starchy, and some of it should be wheat.

Generally it is not a good plan to buy poultry mixtures ready mixed, it is better to buy the grains separately and mix them yourself. Many prefer to store the grains separately and feed one or two at a time. If a mixture is used fowls are apt to pick up what they like and leave the remainder, if you throw nothing but one sort of grain (which presumably you want to get into the fowls to balance the other grains) the fowls are bound to eat it or go hungry.

As a rule, and especially with wheat, a small grain sample can be bought cheaper than large grains. For poultry, the small grains are preferable, first for economy, second they give the more work to pick up, third, the small grains are said to have a larger proportion of albuminoids and of mineral matter than is found in large grain samples.

Roughly speaking, in all grains the outer part of the grain, including the hull (not the husk or cavings) contains a greater proportion of albuminoids than the inner part of the grain.

Thus the so-called refining of flour (throwing aside all but the inner part) produces something which is very white, but which has lost much of the material which goes to building up hard meat and bone. This is why wholemeal bread is a better food than white bread, and why wheat bran is a valuable food for fowls.

All grains keep much better in their whole state than after being cracked or even hulled. This is most noticeable in warm damp weather, when cracked grains, especially wheat, are very likely to spoil.

All grain should be stored in a dry place with good ventilation.

Unless you have exceptional accommodation for storing, it is false economy to buy in larger quantities than you will use up reasonably quickly, from the fear that prices may rise. The risks of loss from rats, mice, damp and other causes of deterioration are too great to make it advisable.

If you are in touch with any large corn warehouse, you may be able to arrange to take over the mixed grains sweepings. If procured direct from the warehouse there is no reason such sweepings should not be perfectly good as to quality—the dirt must be sifted out and a little doctoring may be desirable, such as adding more wheat or sifting out some of the maize, etc. These mixed sweepings are usually sold at a very much lower rate than the separate grains.

As regards the selection of what grains to keep when all are available. If only one sort is fed, then wheat is the best, but some variety is desirable.

Breeding stock should do very well with wheat and oats, and some small stuff to keep them occupied such as millet or Kaffir corn or small dari; during very cold weather some buckwheat or maize might well be added, and as soon as the moult approaches sunflower seeds or a lesser quantity of hemp or linseed should be added to help the growth of new feathers. If procurable, sunflower seeds are to be preferred for this.

Maize, peas and beans should (if used) be all of them given cracked to poultry; for adult birds, most other grains are better given whole.

As a variety in feeding grains may have boiling water poured over them and be allowed to soak (with a cover on) for an hour or even 10 minutes will do a great deal, the water is then strained off and the steamed grain is allowed to cool and dry somewhat, it will in this state be much appreciated by the fowls and will be easily digested.

When buying grains, always smell them, also bite a few and make sure they taste sweet.

In the case of the oily grains such as hemp, crush a few grains, and after a little experience the appearance will tell you if they are in good order.

Later in the book there is a very simple article on the chemical value of food, also a table showing the analysis of most foods mentioned in this book. It is hoped that with the aid of them and of these notes on grains the reader may be able to arrange for suitable feeding with whatever grains he may find available.

So as to give some idea of the relative cost of grains. I have inserted the present retail price per stone.

Chickfeeds are dealt with in Chapter VI.

Wheat.

If possible, give all poultry some wheat every day. If only one sort of grain is to be given, wheat is the best. When other grains are also given, the wheat is best reserved for late in the day. If wheat is the only grain given, the yolks are apt to be pale in colour.

Broad wheat bran, either dry or in a mash, is a very valuable food for poultry.

Sharps are the smaller particles of bran removed from the flour in a later process.

Middlings is the coating of the grain next inside the bran. White flour is made from the inner part of the grain. In a flour mill both bran and sharps are spoken of as offal, but middlings are not considered an offal.

In grinding wheat, part of the process is to remove the germ of the grain. These germs (germ meal) are sold at about the same price as middlings. As these germs have a high proportion of albuminoids in them they should be a useful addition to a mash; I have never heard of their being used, so it may be they are in some way undesirable.

For poultry, good small wheat is preferable to large grains. Feeding with wheat only is said to give light coloured yolks. Present retail price per 14 lbs., best wheat, 1/3, unsifted tail wheat, 11d.

A quart of best wheat should weigh 1 lb. 15 oz.

Oats.

Though excellent as a part ration do not feed them as a whole ration. Avoid long thin oats, especially for chickens, as they assist in crop binding; clipped oats are good when obtainable. There is no harm in kiln dried oats unless they were thus dried because they were damaged. Kiln dried oats are no use for sprouting. Old oats do not germinate well, so, for sprouting procure last year's oats.

Groats (that is oats with the outer skin removed) form an excellent food for chickens.

Ground oats or Sussex ground oats, that is the whole oat with its hull, ground up to a meal, constitutes one of the most valuable foods for all classes of poultry except young chicks. Present retail price per 14 lbs., best oats, 1/4, groats 2/-.

Barley.

The feeding value of barley is good, fowls like it when hulled, but otherwise the hull being so coarse they do not care for it.

Barley meal when good is a very useful food, but I hear it is very subject to adulteration.

Rye.

This is not generally procurable; perhaps that is why it is not more used for poultry. The hull is not nearly so coarse as in barley. If it is to be bought cheap it is worth trying.

Buckwheat.

As a small part of the ration buckwheat is good; it is not so fattening as maize, but still, it is too much so to be fed largely to confined fowls, especially breeding stock.

A usual custom is to give it in winter, but not in summer.

French buckwheat is a small grain variety, and this, when really small, is very useful for chick feeds, but it should not exceed 5 per cent.

Buckwheat, hemp, and linseed altogether should not exceed 15 per cent of a chick feed.

Present retail price per 14 lbs., 1s. 2d.

Maize (Indian Corn).

Fowls fed too freely on maize will, in a few months, get rolls of fat on them and be unable to lay eggs. It is too heating for general use in England, but on specially cold days it is very acceptable and good for poultry. During an English winter one-fifth of the daily grain of confined poultry might, with impunity, be maize, but its effect should be watched.

Maize which has been roasted may be somewhat more freely used. Maize should always be given cracked, and not whole.

A chick feed should have but very little maize in it, a chicken mixture might have up to eight per cent. In a chicken mixture the total of maize, buckwheat, hemp and linseed, altogether should not exceed 20 per cent. of the whole mixture.

Feeding maize gives the yolk a dark colour, feeding much maize makes the eggs less likely to hatch, and the resulting chickens difficult to rear.

Maize meal is useful in a mash, especially when it is steamed with a boiling liquid.

Present retail price per 14 lbs., 11½d.

Rice.

Only a small proportion of rise, say eight to ten per cent. should appear in a poultry mixture, in cheap mixtures and in some others also rice often figures largely. A chick feed is better without rice, and in a chicken mixture there should not be more than about five or six per cent.

Uncooked rice is not easy to digest, and is of a very starchy nature.

Rice is sometimes boiled and added to the soft mash; it is then far more digestible.

As rice is one of the cheapest grains now available, it may in cases be worth while procuring paddy (rice with the hull still on it) and roasting it; it could then be used more freely, being more digestible. I suggest paddy as I imagine it would be difficult to roast naked rice without burning it, while paddy I know can be roasted; also because in some countries ponies thrive well on paddy, though they soon come to grief on rice.

Present retail price 14 lbs., 1s. 7d. (naked rice).

Paddy can be bought much cheaper, but I cannot get a retail quotation.

Peas and Beans.

These foods are of a similar nature. They contain a large percentage of albuminoids which most grains are deficient in. Thus they should be a useful addition to the grain ration to help balance it, but they are expensive, and many fowls do not care for them.

Peas and beans should always be given cracked and never whole; when reduced to a meal they are very useful in a mash. Apart from the expense, not more than one-fifth of the total grain food, whole, cracked, or mealed, should be of peas and beans, as they give some trouble to digest. In a chick feed six to eight per cent. of peas cracked very small seems usual.

Present retail price per 14 lbs., best peas, 1s. 6d.; Indian gram, 1s. 2d.

Darri, Sorghum, Kaffir Corn.

These are three trade names for grains, all belonging to the same general family, Sorghum Vulgare. They are sometimes known as the greater millets, though different to real millet. Sorghum is generally of a reddish colour, darri and Kaffir corn are found both red and white.

Darri is known as Dhurra in North Africa, and as Jowari in India; it is also called Indian millet, and by several other names also. Sorghum comes largely from India and Manchuria. Kaffir corn is a South African variety, it is also called Guinea corn, also African millet, but here again there is confusion because latterly a great deal of true millet has been imported from North Africa and is sold as African millet.

As regards size of grain, they vary very much. As a rule Sorghum is the largest, then darri, and the smallest is Kaffir corn. Darri varies the most, probably it is the result of sifting, but some samples of darri are only about one quarter the size of others, in fact only about twice as big as a large millet grain. When obtainable this small grain darri is very useful for chick feeds. Being much smaller than wheat or oats, all these grains are useful for scattering in litter so as to keep the birds fully occupied in searching them out.

Darri, Sorghum, and Kaffir corn are all of very similar feeding value, being above the average as to richness in hard flesh producing properties.

There need be no fear of feeding these grains too freely.

Present retail price per 14 lbs., darri, 1s. 1d.

Millet.

It is rich in hard flesh forming properties. It gives a very similar analysis to darri, Sorghum, and Kaffir corn. It is found both red, white and yellow in colour. Being such a very small seed, it is always found in chick feeds, and seems a good food for young chicks. One authority, however, considers that a free feeding of millet to young chicks causes bowel trouble, but I have met no other statement confirming this.

Present retail price per 14 lbs., 2s. 6d.

Canary Seed.

This is even stronger in albuminoids than millet. It is both a very small grain and very expensive, and therefore is only used for small chickens.

There seems to be no harm in a free use of it, bar the expense. The chicks like it. In chick feeds it often figures at five per cent., and in chicken mixtures at two per cent.

Present retail price per 14 lbs., 2s. 11d.

Hempseed.

All poultry are very fond of this. It is heating and very rich in oil (30 per cent.).

It should not be fed too freely, three to four per cent. seems a usual allowance in chick feeds, and eight per cent. seems the maximum desirable. It is too expensive for adult poultry.

When buying hemp a few grains should be crushed to see that the oil has not dried up.

Present retail price per 14 lbs., 2s.

Linseed.

This is heating, and a very oily seed (37 per cent oil). It should not be fed freely. At present time it is very expensive.

It helps when the feathers are growing. A little is good for chicks and chickens, and for adult poultry during the moult if sunflower seeds are not available. Chicks do not seem to care for it much. In chick feeds three to four per cent. is a usual allowance, and in chicken mixtures two or three per cent. Five per cent. seems the maximum desirable. Chickens have no need for it once their feathers have grown. Two or three teaspoons of boiled linseed once a day used to be a favourite food to give to sick fowls to help them to keep up their strength.

Present price per 14 lbs., 3/-.

Rape.

I have seen one mention of this as being useful for chicks as a grain feed, but have not met anything to corroborate the statement. It would seem to be too oily a seed, as it contains 42 per cent. oil; anyway the only time I ever tried it the chicks refused to touch it.

As a green food rape is well worth planting. It gives an abundant crop, and stands several cuttings during the year. As a green food rape has considerable effect in darkening the yolk of the eggs.

Sunflower Seeds.

Fowls are very fond of sunflower seeds, and they are wholesome. They contain a good deal of oil, 23.6 per cent., but not so much as hemp, 30 per cent., or linseed, 37 per cent.

They are very helpful to adult poultry during the moult. It is said that fowls will not overfeed on them so long as other food is also available. The seeds are too big for chicken feeds.

The plants grow quickly, and provide much shade, so they are well worth planting; but they should be six or eight inches away from the wire of the run, so that the young plant may be safe from being picked by the fowls. When ripe the heads should be saved and kept for moulting time.

Present price per 14 lbs., 3/-. They are bulky, and weigh light.

Lentils.

Split lentils often appear in chick feeds, and they should be a useful food, but the chicks do not seem to eat them. I have been told that the reason is they are too hard. As only half to two per cent. seems to be the allowance for chick feeds, and as they are of such a showy pink colour, I gather the chief use of adding them is to attract customers.

Short Cut Dried Clover.

This should be cut into lengths of one quarter inch. It is often worth while buying your clover green, drying it yourself, afterwards getting it cut up small and storing in sacks. To be at its best it should be cut before it blossoms, and after the morning dew has dried off. If you have difficulty in getting short cut dried clover the Allen Poultry Company, Sawbridgeworth, can supply clover meal which many people prefer, though it is more expensive. Dried clover or alfafa are so useful in wet mashes that they should be used regularly, at any rate for breeding pens. One half of the bulk of the wet mash as ready to feed may well be dried clover, but it must be cut into one quarter inch length, and when so cut, it also makes an excellent litter for small chickens, as they eat a lot of it and it does them good.

When short cut clover or clover meal is not available for mashes, clover hay may with advantage be thrown to the fowls, and they will eat it freely, but it is better to chop it to some extent and so reduce the chances of crop binding.

Ensilage for Poultry.

This has been tried with great success for winter green food, especially with clover and alfafa. Ensilage has been done on a small scale, and the method adopted was as follows:

The clover was cut just before it blossomed, and at once put through a cutting machine cutting it very fine. It was then packed and well pressed down in air tight barrels. A sack was laid over the clover, then some six inches of straw, and then another sack put over the straw and tucked in. Finally a few heavy stones on the top to press it down. In really air tight barrels only the few top inches of the side had to be discarded as unfit for food when it was opened in the winter. The fowls are said to have eaten it most willingly.

Pepper snd Spices.

Do not give any of these to breeding fowls, or to any birds that you may ever wish to breed from. As regards fowls which are kept only for eating eggs, and which are to be afterwards killed off, then in that case there is no harm done by keeping them well up to their work with red pepper, etc., but it will ruin them for breeding purposes.

Variety in Food.

Fowls in their natural state get great variety in their food. Variety is good for them, and should not be lost sight of both as regards soft food, grain and green food. If fowls get dull, a change of diet will often give them fresh interest in their food.

To Weigh Food by Hand.

To enable you to have an idea as to what weight of grain your birds are eating, it is well worth experimenting as to how much your handful of some of the various grains weighs. It is not difficult for a man to learn to pick up at will a 2 oz. handful of wheat or a 2 oz. handful of oats. Once you have gained this power you know fairly exactly, by counting the handfulls you throw down, how much you are feeding your fowls.

The Amount of Food.

This was a subject I found great difficulty in getting information about when I began with fowls.

The amount of food should correspond to the work done in egg making. Hens cannot keep up a large yield of eggs unless they eat very largely, but on the other hand, hens that are fat cannot lay eggs.

A hen may be too fat for various reasons. It may be she gets too much food. It may be she does not have to take enough exercise (digging) to get her food. It may be she does not have the right sort of food (this is explained later on, see "Chemical value of food") and that, did she but get a little lean meat or cracked peas or cotton seed cake mealed, or clover added to her diet, she would then be content with a much smaller total amount of food and would be in better condition.

If it is considered that the amount of food is too great and must be reduced, remember that hens vary in their nature and some get fat far easier than others, so that if you have a flock laying well but some few are too fat, do not starve the whole flock and get no eggs at all. If you cannot arrange to keep the fat ones separately to be fed lighter, they had best be killed off.

As regards the definite quantity of food, I will give a few figures. A leading firm told me that they fed their birds, a rather large strain of Orpington, 2 ozs. soft food, and 2½ ozs. of grain daily, but I do not know if the soft food was weighed wet or dry.

Some large Croad Langshans who were laying well ate 2½ ozs. of a light strength dry mash and just under 2 ozs. of grain, this in addition to a lot of sprouted oats.

Some Orpingtons, rather smaller birds than the Croads, averaged just under 2 ozs. moistened mash (weighed wet) and 1¾ ozs. grain and a small handful of dry broad bran, also a lot of sprouted oats, these birds were then laying fairly well, but not up to the Croads.

One may like figures for comparison to make a start with, but a far better guide is to give them a sufficiently small quantity, and in such a manner as just to keep the birds at work looking for more during the greater part of the day, and then at the end of the day to give them as much as they can eat so as to get their crops absolutely full, but give the food in such a way as to have a general knowledge of what weight they are eating.

It is worth remembering that about half of the dry material necessary for a moistened mash would suffice if the mash were cooked, as the mealed stuffs swell so much. The account of Mr. Philo's experiment on feeding (page 141) gives valuable data as to the amount of food required by fowls.

Grit and Oyster Shell.

These should be obtained broken to a grade which the fowls like.

A common fault with oyster shell is that it is broken too small; they eat it much more freely when rather coarse, and usually will not touch the small, broken stuff.

Some give oyster shell in the form of coarse powder mixed with the mash, but it seems much better to leave coarse oyster shell in a box and let the fowls take what they want.

The grit and oyster shell boxes should always be watched to see that they are not empty.

For poultry kept out of doors these boxes should be under cover, or the contents get caked together and the fowls will not touch them.

Charcoal.

In America this is very generally kept always before fowls in the same way as grit or oyster shell. It is given in a granulated form, being in pieces the size of a pea and larger. Charcoal is sometimes given powdered on the wet mash. It is given to help the digestion and prevent diarrhœa. I use it, and believe it does good, but can give no actual proof. When charcoal has been absent for some time the fowls are most greedy for it when it reappears. Fine charcoal dusted freely over their soft food once a day until they are three or four weeks old certainly helps chicks to avoid indigestion and diarrhœa. Suitable granulated charcoal, fine or coarse, may be obtained in small packets as well as large quantities from the Cyphers Incubator Company, 119, Finsbury Pavement, London, E.C.

Time Table for Spring or Autumn.

(Wet Mash at Mid-day).

7 or 8 a.m. Open shutters to suit weather, give green food say, 2 ozs. sprouted oats per bird. Empty and clean water fountain. Clean dropping board and redust with earth. Rake up litter and examine it for eggs. If all grain has been picked out, scatter ¼ oz. darri per bird. Examine grit, oyster shell and charcoal boxes, refilling if necessary. Take away hopper of dry broad bran, if this is used, to ensure birds digging. Collect eggs. Remove remains of sprouted oats if any.

1 p.m. Give wet mash say 1½ ozs. before wetting per bird. See that cockerel gets his share. Put down dry bran hopper if used. Collect eggs. Remove feeding boards, (if you weigh contents before and after feeding you will have better idea of what they require.)

4 p.m. Examine litter for eggs and collect from nests. Rake litter level and scatter 1¼ ozs. wheat per bird.

6 p.m. Release or confine broody hens as necessary. Collect eggs. Scatter ¼ oz. oats to be ready for breakfast. Close shutters.

Time Table for Mid Winter.

(Wet Mash Late in the Afternoon).

9.30 a.m. Open shutters to suit weather. If dry bran is used take the hopper away to ensure fowls digging.

10.30 a.m. Give green food, say 2 ozs. sprouted oats per bird. Empty water trough, clean and refill with warm water. Clean dropping board. Rake up litter examine it for eggs, and if all grain has been cleared out, scatter in it ½ oz. oats per bird. Examine grit and oyster shell boxes, refilling if wanted. Collect eggs. Remove remains of green food if any.

1 p.m. Scatter in litter ¼ oz. darri per bird. Put down the dry bran hopper if used.

3.45 p.m. (*i.e.* just before dusk). Give soft food, say 1½ ozs. (before wetting) per bird. Rake litter smooth and scatter 1 oz. wheat per bird for next day's breakfast. See that cockerels are getting their fair share of food. Change water if in open troughs. Take away feeding boards. Feel crops to see that they are full. Confine or release broody hens as necessary. Collect eggs. Close shutters when dark.

Time Table for Summer.

(Wet Mash Late in the Afternoon).

For the long days of summer arrange an exta feeding time and more green food.

6 a.m. Open shutters as early as convenient.

9 a.m. Morning feed as for winter.

12.30 Scatter say ¼ oz. of darri per bird.

3 p.m. Give another feed of green stuff and scatter ¼ oz. of darri per bird.

6 or 7 p.m. Evening feed as for winter.

Note.—If a dry mash be used it must be put down earlier to give them time to eat it.

A Working Man e Time Table.

Such as I believe is carried out with success by people who are away all day at work.

6 a.m. Open shutters, give green food. Empty and refill water fountain. Clean dropping board. Tidy up litter, removing any eggs in it. Scatter 1¾ ozs. grain mixture in the litter.

6 p.m. Refill hoppers with dry mash. See that water supply has not run dry. Collect eggs. Close shutters.

On Saturdays. Have a real clean up, give extra green food, and give a lean meat ration of 1 oz. per bird. Scald the drinking fountain and all troughs. Refill grit and oyster shell boxes.

Note.—For this routine you want litter quite 1 foot deep so as to spread out the work of digging,—also have special nest boxes to prevent egg eating. The grain mixture might be ⅓ wheat, ⅓ oats, ⅓ darri or kaffir corn. The water fountain and grit and oyster shell boxes must be large, so as to hold an ample supply. The dry mash used should be not too strong in meals, so that the birds may be more anxious to dig for grain.

These timetables I have given do not for a moment pretend to be the only or the best way of arranging things.

Everybody must arrange what is most convenient for himself, and these are only intended to give some ideas to the beginner as to what work has to be done. The amounts of food stated are also only given as a suggestion to start on. It is often said that feeding fowls by measure is altogether wrong, but that is absurd. There is no need to limit the amount you give, but unless it is by measure of some sort, (handfulls, etc.) you cannot know how much they are eating or how to correct the feeding, or in fact, to give the same amount of food each day.

CHAPTER IV.

NOTES ON GENERAL MANAGEMENT.

Keep Daily Watch.

Be always watching the fowls, note every bird if possible so as to detect the very first sign of any ailment. Handle the birds frequently, this tames and quiets them and tells you that their weight is not falling off. Note the colour of their combs, note their plumage, their gait. With valuable birds feel their crops at night to see that they are full, this especially as to breeding cocks. Frequently examine the birds for any insect life on them.

Get Your Birds Tame.

This is easily done by treating them quietly and gently, and often talking to them. Tame fowls are far pleasanter to look after than wild brutes that are frightened of you and rush away whenever you go near them. With quiet and kind treatment they will become almost as tame as cats and dogs. As with all animals getting them accustomed to your voice, and to expect some tit bits is a great point.

Sunshine and Shade.

Sunshine is all important for most animals, but more especially for fowls who originally all came from hot climates.

Arrangements should be such that the fowls have the full benefit of any sunshine we may get during the winter months and while enjoying the sun they should be sheltered from any wind there may be.

Getting out of the wind and into the sun just makes all the difference, as we ourselves well know.

As regards chickens, it is well known that for bringing them up successfully plenty of sunshine is one of the greatest helps if not an absolute necessity.

But in summer the question of shade is equally important, fowls baking in a small run with no shade cannot do well. Chickens who cannot get out of the sun on a summer's day will, if small, probably die. Therefore in summer, shade, which they can take advantage of if they wish to, must be provided both for fowls and chickens.

Sunflowers grow very quickly and give good shade, and may with advantage be planted near chicken coops. The seeds when ripe will also be much appreciated.

A rough wood framework with sacking tacked over part of it will give some shade and be far better than nothing.

Broody Hens and Coops.

Every one keeping hens for laying should have a broody coop. When a hen goes broody, if she is at once removed to the broody coop, the fever generally leaves her in about three days or so, but if left to herself, it may go on for weeks.

A roomy fattening pen can easily be converted into a broody coop. A broody coop should have its bottom consist of battens or perches about 1½ or 2 inches apart and raised at least 3 inches clear of the ground. To be comfortable to stand on, these perches should be 2 inches wide and 1 inch thick and be lengthways of the house, so that the hen shall face the front.

The idea is that the air being able to come up under the hen cools her down. If the coop is out of doors, or in a draughty place it should, in winter at any rate, have its back and side walls come right down to the ground to prevent too much draught, and a sack might be arranged to hang over part of the front, but it should be secured so as not to blow away. When the fowl house is big enough, it is sometimes convenient to keep the broody coop inside it. If possible keep the broody coop in sight of other fowls to excite the interest of the broody hens. Give plenty of green food, Epsom salts will not be amiss. The great thing is to commence a treatment at once. Broody hens are most irritating, but rough treatment will not help matters, and besides being unfair it may easily do real harm to them. Some people put her in a small coop with a young strange cockerel, and hold that the extra attention she thus receives, cures her quicker than anything else.

Care of Breeding Cockerels.

Keep a watch on your breeding cockerels. and if you find one losing weight put him by himself for a few days rest, also give him half an ounce of raw lean beef every other day for ten days or so. Frequently feel their crops at night to see that they are full and watch them at meal times; many cockerels keep calling the hens to the food and pretend to eat, but will not swallow a morsel until all the hens have finished, such cockerels should have a little put apart for them and it may be necessary to feed them in a separate coop.

A useful plan is to nail a small box to the wall so high, that only the cock can reach it, and keep food in this for him. Some people regularly give the cockerel a special ration of 1 oz. lean meat twice a week all through the breeding season.

Cocks Fighting.

When you have two cockerels in a breeding pen and they quarrel for leadership, you may often settle the question as follows.

Decide which is the strongest or which you want to be head bird if they are about equal. Let them spar for a few minutes, then pick up the weaker bird, tuck his head under his wing and hold him securely with one hand on each side of him and whirl him round and round a few times, then place him on the floor just in front of the other cockerel. Being giddy he falls over or else the other bird rolls him over at once. He has not been able to see what happened, so in either case he feels that it is the other cockerel who has defeated him, and that it is no use his attempting to be other than second fiddle, after which there is usually peace, but you may have to repeat the performance once or twice. (For cocks fighting hens see page 99.)

Lice and Mites and Sparrows.

Every precaution must be taken to prevent these getting established, as they are most difficult to get rid of. These pests are of very different habits, the lice live on the birds, while mites live in the woodwork, etc.

Lice live on the birds and should be searched for on the head, under the comb, under the wings and especially around the vent. To guard against lice insect powder should be well dusted into the feathers and rubbed in. If any insects are found on the bird, a second application should follow a week later. Some insect powder should also be sprinkled in the dust bath and in the nests.

To keep a flock of fowls fairly clear of lice without much trouble, very effective work is done if even only the male birds are kept well dusted with insect powder. Lice from fowls do climb on to some people, but I understand that they die in a very short time, and therefore need not be worried about.

Sparrows are great carriers of lice and therefore should not be allowed to get amongst fowls, besides which they steal much of the grain intended for the fowls.

To test them I once threw down half a pound of grain in an empty run and in six minutes the sparrows had cleared every grain, the sparrows were of course in large numbers. (One inch gauge wire netting keeps sparrows out fairly well, but nothing coarser.)

Insect Powder.

The "Poultry Review" gives the following recipe which works well and being very inexpensive it can be used freely.

"To three parts petrol, add one part crude carbolic acid. Stir into the above all the plaster of Paris that it will moisten." For this recipe buy the cheap plaster of Paris as supplied by ironmongers, as it is quite good enough. It will be found that after being moistened the plaster of Paris will very soon again dry into powder. It should be kept in a tin. A flour dredger is convenient for distributing this.

A Dipping Solution for Lice.

For those who may wish to dip their birds into a solution so as to destroy all insect life living on them, Professor Salmon advocates a 2 per cent. solution of creolin (*i.e.* cyllin as it is now called). If the solution is warmed the fowls like it better. Some people spray their birds with a kerosene emulsion or the above 2 per cent. creolin solution might presumably be safely sprayed over them, which should be an expeditious way of removing lice, but it should be repeated once or twice to kill off eggs hatching out later.

Mites.

These are far more troublesome to deal with than lice. Mites live in the woodwork and only come on to the hens to feed at night time, thus a hen, on being examined may show absolutely no signs of any insect life, and yet she may be utterly weak and have all the energy taken out of her owing to what she has suffered from their attacks at night time.

To Guard Against Mites.

On the occasions that the litter is changed, after it has been removed and the house cleaned up, the whole of the inside of the house, including the floor, roof, and all nests and woodwork living in the house should be thoroughly well sprayed with a sprayer throwing a fine mist; it is best then to close up the house for 24 hours, that the fumes may have every opportunity of penetrating everywhere. The fresh litter may then be put down and the birds returned to their home, for, of course, they must not be shut up with the fumes. Spraying in a very modified form, that is, along the perches, dropping board, and for a foot above the perches, should take place at more frequent intervals, say every three weeks in summer weather and every six weeks in winter. For these minor sprayings it is not necessary to turn out the fowls if it is done in the morning and all shutters and doors are left wide open. If a run is available to turn the fowls into it is well to give the house a spraying all over inside once a month in summer. If this is done early and the house is left open, the fowls can safely occupy the house the same night. Remember that chickens cannot stand the fumes to anything like the extent that grown fowls can. Some people advocate using stronger spraying solutions in winter than in summer. The idea is that less spraying will then suffice; thus the wood will not get so wet. and therefore dries quicker.

Spraying Mixtures.

One part crude carbolic acid to 9 parts kerosene is a very usual mixture, though some people use it twice as strong. Dr. F. M. Wood, in the "Poultry Review," recommends kerosene 1 pint, crude carbolic acid 1 oz., hot water 5 gallons. In cases where carbolic is not available the Rev. W. W. Cox, in the "Poultry Review," recommends a kerosene emulsion, which may be made as follows:—Cut up 1 lb. soap, dissolve in hot water; while water is hot stir in 2 gallons kerosene, and continue stirring for 15 to 20 minutes. The kerosene, soap, and water must all be thoroughly mixed, especially if it is not to be used at once. To this mixture add 17 gallons of water. This makes a 10 per cent. solution, which he finds strong enough to kill mites, though some people prefer a 15 per cent. emulsion. A sprayer throwing a fine, strong spray is far the quickest, most convenient, and most efficient way of doing the work, especially as regards underneath surfaces, such as under dropping boards, roof, etc.; but, if not available, a great deal may be done by painting the perches and its supports once a week with paraffin. This should be done shortly before the fowls go to roost; the kerosene should not be laid on too thick, or it would blister the fowls' feet and stop their laying.

Boiling Water and Salt.

If kerosene and carbolic are not available, then effective work may be done by throwing cupfuls of boiling salt water against the woodwork. It is no use spraying this, as it would cool too soon; it is said that if the water is saturated with salt this treatment remains effective for six months, but so much salt does not seem desirable in a damp climate.

Kerosene.

Some people report very good results from simply painting with kerosene, but remember that the perches should never be painted with kerosene shortly before roosting time, or the birds' feet will get blistered.

Scratching Litter.

For those who are trying for winter eggs this matter should receive careful attention, both as to what form of litter is to be provided and also as to its daily management.

Burying all the grain ration in deep litter so as to ensure ample exercise to the fowls in picking it out again is, perhaps, the keynote of American poultry work, and many people would even give this as their definition of intensive poultry keeping.

Among the leading poultry men in the United States of America and Canada we find many different opinions. Some believe in the wet mash, others in dry feeding; some use large houses, others small coops; some allow their fowls to run out of doors; others do not.

But on two points, both of them new ideas to the general public in England, they all seem unanimous: (a) The mash, whether wet or dry, must consist very largely of bulky stuffs, such as bran and clover. (b) All grain must be fed in deep, dry litter.

The litter must be dry and deep; that is, even after it has been down for several days it should be 6 in. deep. A straw bed 6 in. deep when first laid would soon get pressed down and become much too thin to give the birds any real work to find the grain.

When it is proposed to scatter the whole of the day's grain ration at one time, the litter, even after being some days in use, should not be less than 1 ft. thick, and more is better. With fairly deep litter the fowls may often appear to be absolutely buried while working it, but this is only as it should be, except, perhaps, on very dark days when there is but little light.

For certain fowls I used to bury their corn in earth, often to a depth of 6 to 10 in., distributed over a space about 4 yards square. True, the soil was sandy, but in the course of two hours 8 fowls used to absolutely clear out every grain I had buried. These fowls were Croad Langshans, heavy, powerful birds, which, perhaps, is a factor requiring consideration.

Material for Litter.

The best form of litter is straw. Until the straw becomes much broken up, the fowls can often succeed in kicking it aside, and so getting at the corn too easily, i.e., on the bare boards. Therefore, when putting down litter it is well to start with a thin layer of earth or sand, about 1 in. thick, and laying the straw on the top of this. Cavings or sawdust would also answer well for this underneath bed, and these would in some ways be cleaner than earth. (If earth be used it should be dry and taken from clean ground.)

About every three or six months the whole of the litter should be removed, and everything cleaned up and disinfected. My own practice has been to do this every three months at least, but I mention the alternative of six months, as some people consider that sufficient.

As regards the material to be used as litter, as already stated, straw (and wheat straw for choice) is much the best, and in every case at least a part of the litter should be straw.

When straw is scarce it may be supplemented by cavings (husks) or dry leaves, or dry bracken, or sawdust, or moss litter.

Cavings are good, and keep sweet a long time.

Dry leaves are often largely available, but they are not very satisfactory; they break up into fine powder and sometimes smell. If used it means that the litter all has to be changed more frequently than would otherwise be necessary.

Dry Bracken: Of this I have no experience. I know it is sometimes used, and I presume it would have much the same characteristics as dry leaves.

Sawdust, especially from red or white deal—and the coarser the better—is often a great help, and it is very cheap if near a saw mill. One winter, when my practice was to bury the corn in earth, I could procure no dry, sandy earth, and I found sawdust most useful to help dry and lighten the damp, clayey earth I had to use.

Moss litter is sometimes useful to supplement the straw, but not the fine granulated dusty stuff as that gets up their nostrils. Some authorities strongly object to moss litter. My experience has been that though most fowls would dig freely in it, some of them objected strongly to scratching in it. It certainly is very absorbent, and helps to keep a fowlhouse sweet and clean.

Remember that moss litter varies very much in quality. Get the dry, fibry stuff, not the hard, earthy stuff which absorbs nothing, and which has been the cause of so many people objecting to the use of moss litter in their stables.

When in search of something to use as litter avoid material which will rot, and putrefy such as cabbage and other vegetable leaves; avoid, also, wiry grass and anything else which might cause crop binding.

Do not let any big stones get among the litter, as it hurts their feet and makes them shy of scratching freely.

Do not let any wood chips or shavings or clippings from tin sheeting get among the litter.

Fresh straw will have to be added to the litter at frequent intervals, as the fowls will gradually reduce everything to almost dust.

One advantage of straw is that the scattered grain sinks into it so easily. In a fowlhouse straw should be thrown down whole, and not chopped up. In a coop it is better chopped to lengths of 1 to 4 in.

When corn is being thrashed the short, broken straw can generally be secured from the farmer at a considerably lower price than you would have to pay a dealer for long straw.

If you have storage room it is worth laying in a large supply of this short straw.

In addition to their ordinary food, fowls require a large quantity of bulky food to fill themselves up with. When clean straw is available they eat large quantities of it, and it seems to do them good. This is a great reason for using straw as litter, and for liberal treatment in the way of throwing them some fresh straw about twice a week.

I know of one farm where each house (containing 100 fowls) has an armful of clover hay thrown into it every day. They say nearly all of it is eaten, and consider this clover hay ration an important part of their food.

I have noticed that with some fowls who had only earth to dig in and no straw, they were all feather pulling and eating badly. Whenever a feather fell out of a fowl there was a rush for it, and it was eaten, no matter how big it was. On throwing some straw in small pieces to these birds they at once commenced eating it. This seemed to indicate that a lack of bulky food may to some extent be a cause of feather eating.

Daily Management of the Litter.

Once every day the litter should be carefully looked through for any eggs that may have been laid in it. Any broken eggs or remaining vegetable matter or other refuse should be removed.

At least once every day the litter should be well loosened and levelled. A light hay rake is perhaps the tool most generally used, though some people prefer a stable hay fork with three prongs.

After preparing the litter as above the grains may be scattered broadcast. If the litter is new the grain will sink in at once, but if the litter is old it will require some further shaking with the rake so as to ensure the grain sinking in.

Earth.

Fowls like very dry, fine, dusty earth to dust themselves in, but not to dig in for corn; for that they prefer something coarser and more mellow, and that does not blow up their nostrils.

Stones in the earth hurt their feet, and should be sifted out.

So long as it is frequently levelled fowls can do a lot of digging in earth 5 in. deep, but much more is better.

It is not desirable to let fowls dig on a manure heap.

Sometimes red sand is troublesome, in that it stains white birds to a reddish colour.

In coops it is well to occasionally pass all the earth through a sieve so as to remove all droppings.

When getting a supply of earth for a fowlhouse be sure to take it from clean ground, not from an old fowl run. It is very good policy to dig up some earth during the autumn and keep it under cover to be ready for winter use; during the winter time it is often a matter of the greatest difficulty to find any decently dry earth.

Perches and Dropping Boards.

A perch of the correct size much increases the comfort of the fowls; they are often too narrow.

Two inches wide and not less than $\frac{7}{8}$ in. thick is a convenient size for Orpingtons. The top should be slightly rounded off. There should be a clear 3 in. between the perch and the dropping board, both to keep the birds' feathers clear of the droppings and also to facilitate cleaning the dropping board.

In cold weather fowls get close together, and only occupy about 6 in. each along the perch. In hot weather an allowance of 8 in. per big fowl is desirable for the length of the perches, and 10 or 12 in. is better.

Perches in a house should not be fixed high up so that the birds have to fly up to them, as they may thus damage themselves, breaking an egg inside, etc., in their efforts to get a foothold.

Three feet seems to be the highest that a fowl should have to jump up to reach its perch. To enable birds to sit comfortably on the perch place the centre of perch at least 9 in. from the wall; 10 in. is better for cocks.

With two rows of perches 12 in. from centre to centre of perches will suffice.

The dropping board for a single row of perches should at least be 16 in. wide; for a double row of perches a width of 29 in. will be convenient. The upper surface of a dropping board should be smooth to scrape clean easily. It is well to have the dropping board entirely detachable from the house, that is, let it merely rest on a shelf at each end; this much facilitates cleaning and disinfecting the house. A batten about $1\frac{1}{2}$ in. wide and $\frac{3}{8}$ to $\frac{1}{2}$ in. thick, fixed lying flat on the outer edge of the dropping board seems desirable; it has the drawback of making it more difficult to clean the dropping board, but it much helps the fowls to get a grip when jumping up on to the dropping board, and often saves them a struggle; this batten must not be of thick wood or the fowls would roost on it.

For coops you want the dropping board to be very light, so as to be easily removable for daily cleaning; so make a light frame of wood (of wood $1\frac{3}{4}$ by $\frac{7}{8}$) of the size you require, nail over it a piece of 2 ply ruberoid roofing material (using the special large headed nails and washers), nail the perch on to this frame. This will give you a really light roost convenient to handle and clean.

Chickens are usually not allowed to roost on a perch until three or four months old. They will at first want a narrower perch than fowls, so as to be comfortable.

Nest Boxes.

All nest boxes and trap nests should be removable, so that they can be taken out and thoroughly sprayed, etc., to prevent insect life.

Try and arrange that nests are dark, also that they cannot be seen into by a hen walking past; both these points will help to prevent egg eating.

A Nest to Prevent Egg Eating.

(see Figure 12).

The arrangement of a nest having a concave bottom with a hole in the centre leading into a lower compartment, into which the egg rolls and there remains safe from the hen, has long been known. Hitherto such a nest has always had to be specially built, but Mr. C. A. S. Hannaford, manager to the Hamworthy Poultry Farm, has recently devised a very simple expedient which may be applied to the ordinary nest box at the cost of a few pence. This expedient has been in use for some months, and has given every satisfaction. The expedient is as follows:—Make a light wood box about 3 in. high and of such a shape as to be a very easy fit over the bottom of the nest. Cut a round hole in the bottom of this box 3 in. across. Turn the box upside down and pack hay all around the hole, giving it a concave shape. Secure the hay by binding it over with string, which must pass through holes made close up to the top of the sides.

If this box is now placed in the nest upside down, that is, with the hay on top, the lower compartment for the egg to roll into will have been secured.

To facilitate getting the eggs out, one side, or a part of one side, may be cut away, so that on opening the long door (the side) of a row of nests the hand may then be pushed in under this lower box to get at the eggs.

Mr. Hannaford has found that this box must to some extent correspond to the size of the hen. Thus, with rather large nests and Leghorn fowls he uses a box only 11 in. by 7 in., which is placed in the centre of the nest.

Apart from the danger of egg eating, this arrangement prevents hens from sitting on the eggs and so starting the germs, and therefore only one daily collection of eggs becomes necessary, which means great saving in time.

Dust Bath.

(see Figure 9).

Always provide some means for the fowls to dust themselves. A convenient dust bath, not to take up too much room and to keep the earth in to some extent, may be arranged as follows:—Get a box about 2 ft. long, 1 ft. 8 in. wide, and 2 ft. deep. Lay it on its side, and nail 4 battens of wood to it to act as legs, and so raise the box 2 ft. above the ground; the opening giving access to the box is now at the side. A plank 6 in. or 8 in. wide is now nailed along the bottom of the opening so as to keep the dirt in, and a shelf may be arranged for the hens to alight on when jumping up. The hens can now easily get in from the side, and the top, bottom, and three sides of the bath are all closed, so that the dirt does not fly about so much. The top forms a convenient place to stand the water fountain. This idea originated with Miss L. Mulroney, of St. Kilda, New Milton, Hants., who specialises in a strain of Campines noted for their great laying powers. One advantage of raising the dust bath on legs is, of course, that it does not then take up scratching room, as the hens can work underneath. The dust should consist of very fine sifted earth, and be absolutely dry. There should be a little insect powder mixed with the earth.

Moulting.

Fowls moult every year, completely changing all their coat; under some circumstances they moult twice in the year. This yearly moult holds good with all the birds of the air, but with undomesticated (wild) birds the process is so gradual that it never interferes with their flight. For domesticated fowls the complete process usually takes from 75 to 100 days. It is a very exhausting time for them and they should have every care.

Hens require some little time to recover their strength and condition after moulting; thus any hens which get through the moult early in the autumn are likely to commence early with their winter eggs, and therefore, generally speaking, such birds should not be sold off in the autumn but kept until the spring.

As a general rule the older the hen the later she starts to moult. Early-hatched pullets often do a partial moult in the autumn, but do not change all their feathers, and often continue to lay all through this minor moult.

August and September are two months often occupied with getting new feathers.

Hens kept in confinement sometimes moult at quite different times to out of door stock. I have known them go into the moult in the early spring just when their eggs were wanted for incubation, which completely upset breeding arrangements.

The bird makes her new feathers out of the food she eats; as a rule, she cannot continue making eggs as well as new feathers. Though she requires generous feeding at this time, she does not need as much strong food as when in full lay. It is not an easy matter to arrange the food for moulting hens; if they get too little the growth of new feathers is retarded, and yet, of course, the birds must not be fattened.

It would be a great convenience if we could get the birds to moult exactly when we wished, but this cannot as yet be satisfactorily arranged.

So far as I can gather, the moult is started by the young feathers growing and gradually pushing out the old feathers, which gradually dry up as to their roots, and so fall out.

The principle that some people try to work on is as follows:—Reduce the food supply so as to check egg production, and so divert the hen's machinery from egg making to feather making; then gradually revert to fuller rations.

It is easy to give the treatment, but if the hens do not feel inclined to moult it is difficult to get them to respond.

Some breeders, when wishing to bring on the moult, commence by starving their fowls and then feeding them heavily with oil meal. Mr. Elmer F. Haag, of Chicago, U.S.A., in one of his many able articles appearing in the "Poultry Review," strongly condemns this practice as not only useless but undesirable, as it may very possibly cause bad indigestion and upset the fowl's health for a long time. He recommends ordinary feeding with plenty of green food and sunflower seeds; as much of these as the hen will eat, as the oil in them greatly helps the growth of new feathers.

If sunflower seeds are not available, then some linseed or hemp would assist the feather growth; but it should be given in the form of grain, so that the hen need not eat it if she does not require it.

Linseed and hemp should not be given freely, as may be done with sunflower seeds.

As we know that a change of quarters, also the letting of confined fowls out of doors, undoubtedly causes a check to egg laying, it would seem that something on the following lines might help expedite the moult; but I have not yet tried it, and do not pretend to lay down that it would ensure success. About the middle of July turn the fowls out in a run or, if they have already been living out of doors, change their run and surroundings as much as possible, considerably reduce the ration of soft mash and grain and meat, but give them unlimited green food and dry bran. By this treatment I should hope to check their egg laying, after which I should get gradually back to stronger feeding, including the sunflower seeds and, of course, continuing plenty of green food.

Be sure to provide shade for any hens moulting during hot weather, as when denuded of feathers a strong sun causes blistering to their backs and much discomfort; but this precaution applies more to hotter countries than England.

If at any time a fowl's feathers get brittle and break it is desirable to give them some fat or oily grain to help soften them.

If fowls take to moulting into bare patches, or at irregular times, read the article on "Irregular Moultings" in Chapter VII.

Fowls are often neglected while in the moult. This is unfair, and they certainly do not deserve being knocked about—a form of treatment they sometimes get. Fowls who are moulting in October are very unlikely to be laying before Xmas.

To Carry a Fowl.

It is quite possible to injure a bird in many ways by carrying it incorrectly besides making it frightened. Mr. E. F. Haag points out that "the bird should be held rather firmly between the arm and the body, with the head back of you and the hand lightly clasping the feet. In this way you have the bird under full control. It will not fight to get away, and it has plenty of breathing space. If you hold it with the head to the front it rests in a crouched position, will soon get its wings free, is very apt to peck you, and unless you fairly choke it it is likely to topple forwards."

Of course, all fowls should be gently handled, and especially broody hens, annoying though they may be. Never tie a fowl's legs together very tightly; it is quite unnecessary and causes them much pain. If soft string is used and a turn is taken round each leg they can be fairly loosely tied so as to be comfortable and yet cannot get away.

Definitions.

A chicken in the market usually means a bird, tender to eat, not too big, and not looking too old.

Among many poultrymen a chicken ceases to be a chicken as soon as you can discern the sex.

A cockerel and a pullet become a cock and a hen when they are twelve months' old.

NOTES ON EGGS.

Brown and White Eggs.

GENERALLY speaking, domesticated poultry may be divided into two classes—the Asiatics and the Mediterranean, the former as a rule being the heavier breeds, laying brown eggs and being more addicted to going broody.

The Mediterraneans are lighter and more active birds, laying white eggs, and are less addicted to going broody. These are often spoken of as the non-sitting varieties; it is supposed that to some extent broodiness has been bred out of them owing to the custom of the ancient Egyptians of doing most of their hatching by incubators.

Of course, many of the present-day breeds are mixtures of both Asiatic and Mediterranean, but the characteristics do not seem to blend equally, as in most varieties there is generally a decided preponderance of either the Asiatic or Mediterranean peculiarities.

Value of Eggs as Food.

According to the French Government reports, ten eggs form the food equivalent of 1 lb. of beef.

Sterile Eggs.

These keep better than fertile eggs; therefore for eating eggs it is best to keep no cockerels, especially if living in a town, as there is then no crowing and annoyance to neighbours. The hens will lay just as well without a cock.

Fertilisation of the Egg.

Eggs are often fertile three days after the cock's appearance, but on the sixth day they should be safe.

Fertility usually ceases with the sixth or seventh egg after the cock has been removed.

When a change of cocks has been made it is best to wait two weeks, to be sure that eggs have been fertilised by the second cock and not by the first.

The Germ of the Egg.

Every egg contains a germ area, even though it may not have been fertilised. It lies in the outer skin of the yolk and always floats uppermost. It may frequently be noticed as a small spot when eating a boiled egg. When the germ cell of an uncooked egg is placed in a magnifying glass, if fertile, the outer part appears whitish and the centre transparent except for a few very small white specks. This central transparent part is the life germ. If the germ area has not been fertilised it appears whitish all over except for small, clear spots irregularly distributed over the surface.

Cleaning Eggs.

Eggs for incubation should be cleaned if dirty; use tepid water.

When cleaning table eggs, use cold water and remove stains with a sponge dipped in vinegar; the vinegar will also prevent them from getting shiny, unless rubbed hard.

So as to remove as little of the bloom from the shell as possible, do not wet more of the egg when cleaning off a small stain than is absolutely necessary.

Musty Eggs.

This may be due to feeding. For example, onions or fish.

It may be due to liver disease.

It may be that they have been sat on so long as to cause the germ to develop, after which the eggs have cooled and the germ has died.

If fertile eggs are sat upon by hens for four hours consecutively the growth of the germ may be started, and this may easily happen when several hens use the same nest consecutively. When such eggs are collected and cool the germ dies and the eggs are spoilt, and if kept a few days they turn bad. Hens do sometimes lay an egg which tastes stale, though new laid, but the above is a more frequent cause. Eggs which have been thus sat upon for several hours are, of course, spoilt for hatching purposes. For this reason frequent egg collections are desirable, but it seems much more convenient to arrange the nests as described for the prevention of egg eating and so serve the double purpose, and in this case one daily egg collection will suffice.

Pale-coloured Yolks.

This does not at all affect the hatchability of an egg. A large supply of young growing greenstuff, especially rape, *i.e.*, the green plant, helps to darken the colour of the yolks. Pale yolks are more often met with in winter than summer. Giving wheat as the only grain, or sprouted oats as the only green food, or want of variety in food generally, are all said to cause pale yolks. Feeding maize gives dark yolks. Occasionally giving sulphate of iron in the drinking water is said to help darken them.

Watery Eggs.

If the white of an egg is too watery it generally means a want of albumenoids in the food, *i.e.*, give more meat, or milk, or peameal.

Egg Yield.

For a pullet to be really profitable she should lay about 145 eggs in her first year.

During her second year a hen usually lays about 20 per cent. less than in her first year.

Preserving Eggs.

To preserve eggs at their best use waterglass. Use pure water which has been boiled and allowed to cool. The proportion is one tinfull of waterglass solution to ten similar tinfulls of water; roughly, a 10 per cent. solution. Do not put the eggs in until the mixture is quite cold. Do not put in eggs more than 24 hours' old, nor yet while still warm from the hen. Never put in a cracked egg. If the eggs float it shows the mixture is too strong, and more water should be added. Clean all dirty eggs before putting into waterglass. As the water will evaporate, and as all the eggs should remain covered, commence filling another jar as soon as the eggs are within two inches of the surface. If some of the eggs break or go bad they may spoil all the other eggs. It is therefore advisable not to have too many eggs in one jar. Something the size of a slop-pail is big enough.

A good egg properly preserved in waterglass is quite fit to use as a boiled egg when four months' old, but as the shell is no longer porous, each end should be perforated just before boiling to prevent cracking. No thin or cracked eggs should ever be put in waterglass.

Eggs can be satisfactorily preserved by packing them in salt, but be sure each egg is surrounded by salt.

Salt butter, or even lard or vaseline, are used by some people. For this the hand is greased and each egg is then well rubbed in the hands so as to close all the pores.

Simply wrapping each egg up tightly in newspaper will preserve them for a considerable time.

At a recent Government test in Germany as to the best way of preserving eggs some twenty methods were tried. Of these three only were considered worth following, namely, waterglass, which was far the best, the other two being lime and vaseline.

Eggs for Incubation.

Should be as fresh as possible, but up to 14 days' old they should give good results.

Eggs from three to six weeks' old, and even older, will hatch, but the vitality is low.

Dirty eggs should be cleaned before being set.

A well-fertilised egg, four weeks' old, is much more likely to hatch than a fresh egg poorly fertilised or from improperly-fed hens.

Avoid very large or very small eggs. Two ounces is a good size. Avoid rough eggs; a rough end does not matter if otherwise good. Avoid those with a metallic ring when tapped, they are usually unfertile.

Where a hen regularly lays specially rounded or pointed eggs such eggs will hatch as well as the ordinary shape.

Eggs with a raised ring round them are useless.

To store them, leave lying on their side; do not turn or handle them much.

If eggs remain several hours in a temperature of 80 deg. F., or of nearly freezing point, the vitality is much impaired.

When packing to send by train, roll each egg in a piece of paper. Each should be folded in exactly the same way, to reduce chances of accident when unpacking. They should be in a box, with a thick layer of hay, etc., between them and the box. The box should be light, as heavy boxes are more roughly handled.

Wash all dirty eggs before placing in incubator, using tepid water.

Before placing in incubator it is well to mark them, such as A on one side and P on the other, so that when turning them you may be sure of not having missed any.

Periods of Incubation.

Fowls' eggs generally require 21 days to hatch out. The heavy breeds often require a day longer. A good deal depends on the freshness of the egg. An absolutely fresh egg will often hatch 12 hours earlier; an old egg may easily take 22 days.

The heat of the incubator also affects the question. If too hot, some chickens might arrive in 19 days; if too cold, they might take 24 days, but in either case it is unlikely that the chicks would live to grow up, they would almost certainly be weaklings.

Ducks vary from 27 to 34 days; greese from 30 to 31; guinea fowl from 27 to 31 days.

Grading Eggs for Market.

Eggs for market should be graded, *i.e.*, all white eggs packed together, all brown eggs ditto. Eggs should be of even size; rough eggs should not be sold. Badly stained eggs should not be sold.

Make every endeavour to prevent the eggs getting stained, as cleaning them is certain to remove some of the bloom and so considerably reduce their value as high-class breakfast eggs.

How to Hold an Egg While Testing it During Incubation.

You require one light only in the room, and that a good lamp or its equivalent.

Hold the egg, grasped close up in the gap between the thumb and forefinger of the left hand.

Use the gap between the thumb and forefinger of the right hand to similarly screen the other end of the egg, so that when held close up to the lamp no light shows around the egg, but only through it.

This is far quicker than using the ordinary testing lamp.

Testing an Egg During Incubation.

If when held up to the light and twisted round and round so as to see all parts the egg remains clear and transparent, though it has been a week in the incubator, it means that the egg is unfertile. The germ first develops to something in the shape of a spider. If the germ continues to grow properly, then after 10 days' incubation it appears altogether opaque and black.

If a reddish streak appears, it means the yolk is broken. The condition of the germ is easiest seen in a white egg. With some of the brown eggs of the Asiatic breeds you may have to wait till the eighth day, or later, to be certain of their being unfertile. About the 14th or 15th day a final test should be made to remove undeveloped eggs.

Testing Market Eggs.

Eggs when first laid are practically full of liquid. As the shell is porous, the liquid gradually dries, leaving an air space. The older the egg the larger is this air space.

No practical method has as yet been discovered for testing the age of eggs with any accuracy. Something may be done by holding them up to a light, in the same way as when testing incubator eggs, and observing whether the air space is large or small, and also as to whether the contents of the egg are prefectly clear and transparent, as they should be in a good egg.

In some places it is usual to test eggs in salt and water to see whether they will sink and lie flat on the bottom, or, if older, they may tilt up nearly on end, or they may float just below the surface, or a considerable portion of the shell may be above water.

This method may tell you whether an egg is one day or 15 days' old, but not always. In a mixture of two pints of water to five ounces of salt most eggs one day old will sink, but to ensure that all such will sink you must add another four or five ounces of water, and in this weakened mixture the majority of eggs 10 days' old will also sink. Many eggs apparently even start life with an air space of some sort, and the thickness and texture of the shells also cause considerable variation. If this salt and water method is to be employed, procure kitchen or rock salt which is fairly pure. The usual table salt perparations contain so much ground rice, etc., added that it would quite throw you out in any calculations.

As some sort of guide, I may add that on testing 24 eggs, each 21 days' old, in this weakened solution (5 oz. salt to 2¼ pints of water) all the eggs floated. None of them showed more than the surface of a shilling above water, and some showed very much less.

Though it is difficult to lay down any definite scale, it is easy to arrange a test by which you can be fairly certain no egg is over some certain age. Many dealers examine each egg with a light and reject all that are not clear. Some give a further test in plain water, rejecting all that float. Others reject all eggs which stand absolutely on end on the bottom of the bucket or basin; but their being clear when examined at a light is perhaps the most important.

Eggs keep longer than many people imagine. A good egg which has been kept five weeks without any preservative would in many places be considered quite a fresh egg, even boiled, though it might look rather empty.

I allow that the few eggs I have tried this way may have been sterile eggs, which, of course, keep longer. Of course, however, an egg as old as this, does not taste like one laid the same day as eaten.

To Get Hens to Lay at Home.

Hens, like many other animals, are very fond of the smell of aniseed. It is said that a few drops of oil of aniseed placed in the nests will ensure that hens on a free range will lay their eggs in the proper place and not under hedges, etc.

A not infrequent cause of hens laying in hedges, etc., is that they can get no peace in their nests owing to insects.

Rats and Mice.

If you have rats about it is well worth while covering the bottoms of chicken coops with fine wire netting. Remember, also, that any openings at the sides will also want protection.

If either rats or mice attack any foodstuffs you may have in wooden boxes, try thoroughly painting the outside of the wood box with one of the creosote preparations. I found that they would never gnaw at any corn box within two months of its being so treated.

If one has to take to rat catching seriously, it is worth while getting a pair of housemaid's washleather gloves. To avoid these getting the taint of the hands they should only be put on while setting the trap, and, of course, both the gloves and traps should be handled as little as possible. Rats and mice are rather fond of the smell of aniseed, and I feel sure that having a little of it on the gloves has helped me in this way.

In many cases a trap does better without any bait, as there is then nothing to make them suspicious. In this case the trap is set behind a box where the rats are sure to run, and some chaff scattered over all quite hides it. For this work a nipper rat trap works well, but as no bait is used a piece of wood must be fitted for the rat to tread on and so let off the spring.

If an isolated outhouse is attacked by rats, and a rat is caught, he should be left in the trap. The other rats may eat him or they may not, but they are very likely to leave that outhouse alone for a long time. It is always worth while to leave a dead rat in a trap if one's object is to scare them.

I have lately heard that a good cage trap gives most successful results if it is set with a bone inside as bait, and on any rats being caught one or two should always be left in to encourage more to come. It is said that very large numbers may be caught this way, but it seems hard lines leaving rats shut in unless they are supplied with water and some food.

Rats soon pick up new ideas, so the methods employed against them should be frequently changed. Ferrets are very useful..

Rat poisons are, some of them, decidedly undesirable. I hear, however, on very high authority that "Ratinol" is safe and effective. It is a preparation discovered by Dr. de Christmas, of the Pasteur Institute staff.

Value of Droppings.

The droppings removed from the fowlhouse every day should be carefully saved, as they form a considerable asset towards the profit on the farm. They should be kept under cover where they may dry. If any old packing-cases are available, they are well stored in them, a few inches of earth being placed on top to keep the air out. To get the full value for them there should be no lime or ashes allowed to mix with them, as these help to liberate the ammonia and nitrogen. A little earth with them is an advantage, but not more than that dusted on the dropping board to facilitate cleaning. Fowls' droppings should never be used fresh near tender roots. If used fresh the fertilising should be done between rows of plants. It forms an excellent top dressing for lawns, and should be put on in winter when the sod is dormant.

It is most convenient and safest to use in the form of powder. When really hot weather comes the droppings will soon get absolutely dry and may then be easily crushed to a coarse powder, and in this form can be safely used anywhere, scattering a little as with any other plant food.

Now as to the money value of this fowl powder. The high-class plant foods and the cheap guanos (the latter being frequently material drawn from the sewers of large towns) vary in retail price from 20s. to 5s. per cwt. carriage paid to any railway station. The good, high-priced plant foods are no doubt much more valuable than fowl powder, but scientists say that a fairly pure fowl powder would, for general flower and vegetable garden purposes, be a very much more valuable dressing than the usual guanos manufactured from sewer produce. From this it would appear that it should be well worth while for people to fetch good fowl powder from a poultry farm at a rate of at the very least 5s. per cwt. This would mean a large rebate on the food bill, but it would be difficult to carry all this out unless some outbuilding was available to give the necessary shelter.

To Set a Hen.

Get a box about 14 in. square and 16 or 18 in. high. Fill it about five or six inches deep with fine dry earth, arrange a hollow in the centre, dust a little insect powder over the earth, cover the earth with a little clean straw or hay.

The nest should now be of such a shape that if the hen. while turning her eggs, should kick onc into the corner of the box it will roll back again into the centre.

If the eggs are valuable, 10 or 11 are enough to put to a hen. The box should be placed in some quiet outhouse. A piece of wire netting, with a brick to steady it, should be placed over the box, also a piece of wood to partly cover the box and keep it fairly dark, but leaving plenty of air.

Before putting the hen to the eggs, she should be taken to the box in the evening, be well dusted with insect powder, and put on some china eggs to test her for 24 hours. If she sits well and appears satisfactory she may be taken off the nest and a feed and water given to her. Meanwhile the china eggs are exchanged for the real ones and the hen is put back as soon as she stops feeding. Once she has started on the real eggs some people do not disturb her for two days, unless she seems anxious for food, but after that she should certainly be fed and watered once a day. While the hen is feeding the eggs are getting their daily airing, which they require. With an incubator the time for airing allowed is about five minutes the first week, 10 the second week and 15 the third week, but on certain particular days a longer airing is recommended, and this seems the hens' idea also, as some days they seem to want to keep off the eggs for half an hour, so perhaps the hen should be considered the best judge, but as a rule about quarter hour should satisfy her.

During the last day or two incubator eggs don't like being aired, and similarly I have noticed hens often sit extra tight just then.

This one daily meal to the sitting hen should be as much as she will eat, both of soft mash and grain, and water and grit and green food.

Do not sprinkle water on the eggs. If fresh, they do not require it; if stale, they are not worth it, and you might spoil any fresh eggs amongst them.

Should the hen break any of the eggs, then the nest should be cleaned, and the remaining eggs washed if any of the broken egg has got on to them, otherwise the pores in the shells get closed up and the chicks inside will die from want of air.

Some people advise that as soon as any of the eggs are found chipped the hen should be given as large a meal as she can be persuaded to take and then left on the nest until she has brought the hatch off.

Buying a Cockerel.

If you have good laying hens and are looking for a fresh cockerel to avoid inbreeding, do not buy a bird at hazard. He may come of a poor laying strain and completely spoil your stock for next year as layers. Being good layers is just as much a matter of strain in fowls as being quick growers is in pigs.

If your hens are not doing as well as they might, a change of blood in the form of a cockerel of a good laying strain may very much improve matters. Remember that as regards egg-laying powers of the resulting chickens, half of the strain will be the cockerel's strain, and as one good cockerel will do for several hens, it is worth paying something for a good one.

Culling.

When deciding what birds you will keep for breeding, remember it is not the least use keeping any culls. They will spoil the appearance of your flock, and you will waste money by keeping them and breeding more of the same sort. It is far better to have fewer birds but all of them good.

Remember that severe culling only means adhering to Nature's law of the survival of the fittest.

Age When Pullets Commence to Lay.

Pullets commence laying at ages varying from four months to eight, and even longer. Some people like them to commence very early, as thereby showing greater vitality. Others say it is better for them not to begin laying too young, as they are not then able to stand the strain.

The majority seem to hold the latter view and like their pullets to commence when close on seven months' old.

Leghorns and Campines commence laying at a younger age than the heavy Asiatic breeds. (See also "Hatching best time for.")

Selection of Breed and Strain.

If you are thinking of keeping fowls, try and get to a good poultry show and see the various breeds. Find out which breed most appeals to you, and before deciding look at more examples of the breed you fancy and make full enquiries about them. There are a few fancy breeds which never lay many eggs, and these would be useless for utility purposes, but so long as you avoid these few breeds it is much the best to choose the one which most appeals to you.

Presuming you want to produce eggs, the really important thing is to get a good laying strain. Some exhibition birds are no doubt of good laying strain, but many are not.

If it were possible at a poultry show to allot points for egg-laying capacity then no doubt this would have been done long ago, but under ordinary circumstances it does not seem practicable, and naturally many people breed accordingly.

Utility is a term often met with in refence to poultry. It may mean everything or nothing. It is not a good expression to use when making enquiries about stock. Not infrequently the remainders from what has been bred for exhibition, proving not good enough for that class, are worked off as utility fowls.

The specialists in utility fowls are the people who have been successful in the big egg-laying competitions. So it is with dogs. The utility side is dealt with at field trials and the ornamental (?) at dogs shows.

The owner of one of the best egg-laying strains in America used to conclude his advertisements as follows:—"If you want chickens that will lay eggs, come to me, if you want to win prizes, don't worry me, but go to a feather merchant." It is a quaint wording, but there is a good deal of truth behind it. I once bought utility fowls from a feather merchant, but I did not keep them long.

For utility purposes I should therefore avoid exhibition stock, but, of course, you will get thoroughbred birds. If you get these and of a good laying strain you will get more eggs, and the eggs will sell well for settings. Your yearly expenses will be no higher, and you will have birds to look after that you can take some pride in.

If eggs are your main object, the light breeds, such as Leghorns, seem desirable. If you want both eggs and table fowls, a heavier breed may be preferred.

When selecting your breed you should consider the soil you live on, and make enquiries on this point concerning the breed you want to select. On a dry sandy soil any breed should do well, but on wet, clayey soils some breeds fare very badly.

I have noticed in several places in England having very wet soils that there seemed to be a lot of Plymouth Rocks kept. The explanation given me on several occasions was that they were the only breed that would thrive there, but I cannot say how far such a sweeping statement was correct. These Plymouth Rocks all seemed very healthy, and some were wading about in water fishing up food from the bottom like ducks.

Do not keep several varieties. It is best to specialise in one breed only; your profits will then be considerably greater.

I may seem to have made some adverse remarks about exhibition dogs and poultry, but were there no poultry, dog or other live stock shows there would be very few of the handsome, thoroughbred specimens of these animals which are now to be seen all over England, and were these shows to be given up we should soon be but little better off than some other countries where domesticated animals, though good at their work, are often not much to look at.

When to Buy Stock.

If starting in the early spring, buy settings of eggs; if later, buy day-old chicks. If the middle of May has arrived, or later, try to buy chickens which were hatched in March or April, or earlier, but do not start with late chickens if you can help it, as it will prevent you getting really into the swing for a year or more.

There is one time in the year which gives an excellent opportunity of getting a really good start for little money, and that is in the late summer and early autumn while the birds are moulting and breeders are getting rid of their old birds to make room for the young stock just grown up. You can then often buy a really good pen of old birds at a reasonable price, and though they may be past giving very heavy egg yields, they would be excellent for breeding from.

Some Data for Breeding.

The value of chickens depends more on their ancestry than on their feeding and up-bringing. That is, ancestry is absolutely of the first importance.

Chickens from the inferior birds of a good strain are far preferable to those from the picked birds of an inferior strain.

Inbreeding must be avoided, or the vitality of the stock rapidly declines, and after two or three generations the resulting stock becomes delicate and useless. Mating first cousins is not considered inbreeding, but nearer relationship generally means trouble. To maintain a strain it is sometimes necessary to mate father to daughter, etc. This, though undesirable, is not nearly so dangerous as mating own brothers and sisters.

Do not breed from any birds that have have had a real sickness.

Do not breed from pullets. Chickens raised from pullets for several generations are nearly impossible to rear. Parents between 1 and 1½ years' old are most likely to produce the strongest chicks, but good older birds should not be despised. Do not use a cock who has been continuously with females for a year; he should have at least two months' rest. The size of the chicks depends chiefly on the size of the hen. The winter-laying hen gives you more chances of producing winter layers.

The laying powers depend as much on the father as on the mother. Great vigour and vitality in both parents is, however, the most important of all the requirements.

Breeding Layers.

When trying to build up a laying strain do not select specially large hens. The biggest pullet out of a batch of sisters is not likely to be the best layer.

A good layer is generally rather broad behind, and yet not the broadest, her head is lean, eyes bright, comb large for the breed, she is lively and restless, with saucy inquisitive manners. Reject hens with dull eyes, fat heads and sleepy manners.

Do not select a hen which lays exceptionally large eggs. Her supply of egg-making material would give a greater number of medium-sized eggs, say of 2 oz. each.

A good layer must be a big eater, and therefore should have a big crop, which should be full every night. To be a really big eater she must be educated up to it from the very start (*i.e.*, plenty of dry bran).

Hens lay their eggs in batches, taking a rest usually of one week between the batches, but if improperly fed they will take a much longer rest.

A batch may be 9 eggs or it may be 50.

Some hens lay in small batches, giving an egg every day. Others continue much longer, but giving an egg only every other day.

The pullet who first starts off with a batch of 16 to 20 eggs, laying daily, and then takes her rest is the one who will probably become a big layer.

Select a pullet who as a chick eat more and hustled about more than the other chicks.

Avoid a pullet which feathered slowly as a chick.

Do not breed from birds under 11 or 12 months' old, and two or three months older is better.

Do not breed from birds that have ever really been ill.

Absolutely above all select birds full of vigour and vitality.

This is about all we have to go by unless trap-nesting is used, but if we have an exact record of the eggs laid then we have what is, next to vitality and health, the most important guide of all, for hens do not always live up to their appearances.

As regards hens all of the same strain but who varied in the number of eggs they had produced, then again vitality and perfect health would be even more important than having the absolute greatest records. I do not mean that I would prefer a specially healthy hen of an unknown strain, but I suppose these hens all to be of the same good strain, in which case my first pick would not so much be the absolute biggest egg record, but so long as she had a decent record I would prefer the medium or medium large-sized hen with the greatest vitality and who had never been sick or sorry.

As regards exhibition points, I presume you are not breeding for this. But even so, it does not seem desirable to keep in a breeding pen any bird which has any absolutely disqualifying defects for its breed. Unless you pay some attention to this and avoid breeding from birds who have thrown back to various ancestor breeds, your strain may easily deteriorate in appearance and become variegated, which would please neither you nor the man you want to sell to. This does not mean breed for appearance, but put aside birds having gross defects and then select from all the remainder according to their value for a laying strain.

A summary of the points for selecting breeding hens seems to be:—

1. To be of good laying strain.
2. To be one year old or more.
3. Vitality and health.
4. To have good egg record.
5. To lay medium-sized eggs.
6. Hen to be of medium large size only.
7. To have a large crop and be a large eater.

Remember that a strain may be completely altered by breeding. A bad layer may become a good layer—a sitter may become a non-sitter, and *vice-versa.*

Therefore unless care be taken you may by careless breeding completely spoil your strain.

As regards when to hatch out chickens that they may become good winter layers. For Leghorns, April or May are considered the best months, while for the Asiatic breeds March or April are the best, some people considering that the April-hatched birds are less likely to spoil your plans by going into the moult.

The yearling hen gives the strongest chicks.

Chicks hatched from pullets' eggs for several generations are very difficult to rear.

A hen 12 months' old is old enough to breed from, though 15 months is preferable.

Some Leghorns are hatched out as late as June, but for winter eggs after the middle of that month is too late even for these light breeds.

As regards the cockerel, remember the resulting strain will, half of it, depend on him, and many say that more than half depends on him. Therefore as only one cockerel is required for several hens, a big effort should be made to get one who, besides being full of vitality, comes of a really good laying strain.

A cockerel for a breeding pen should not be under 11 months' old. A cock should be separated from the hens for at least a two months' rest before the breeding season begins.

Line Breeding.

The result of mixing different strains is often uncertain, even when both birds are of really good laying strains. For this reason line breeding is much in vogue, the object being to produce several groups not too closely related for freely mating together and yet all of the same strain.

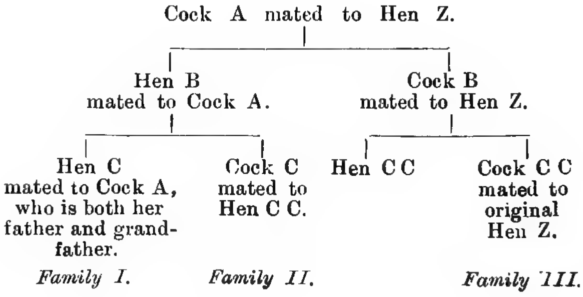
Given an unrelated Cock A and Hen Z. both of the same strain, the safest way is to work on the lines of the following chart. This in the third generation gives you three distinct families, I., II., and III., the progeny of which will be as follows:—

Family I., almost entirely of the blood of Cock A.

Family III., almost entirely of the blood of Hen Z.

Family II. in blood will be half Cock A and half Hen Z.

Chart.



NOTE.—Hen B, Cock B, Hen C and Cock C C must all be most carefully chosen for health and vigour, as their matings mean very close breeding, which is unavoidable in the first steps of line breeding, where but few birds are available.

Of course, both Hen B and Hen C might have had some own sisters who might have been mated to Cock A. Also some more of Cocks C's brothers might have been mated with some of Hen C C's sisters, so that far more than three groups for intermating could be arranged for in the third generation, but every bird would have the blood of Cock A and Hen Z in the same proportions as one of the three families I., II. and III.

The chart will serve to show the general principle, *i.e.*, that any groups containing the blood as in I. may quite safely be mated with any group containing blood as in II., and more particularly III.

Breeding for Sex.

It used to be held that mating old cocks with pullets resulted in a preponderance of pullets among the chickens. The results, however, were uncertain, and I gather this theory no longer holds credence.

If we could control sex it would be a great point gained, for hitherto breeders generally consider it desirable to hatch out close on 250 chickens so as to be certain of 100 pullets.

In the August 13, 1913, number of "Eggs," Mr. Oscar Smart contributes an article on this subject of breeding for sex. He holds that:—"(1) Sex is inherited from the female alone, and (2) that there is great variation between different hens in respect to the transmission of sex."

Thus, to produce a strain of pullet-breeding fowls, some good hens should be selected for a breeding pen. Their chickens should all be carefully marked and records kept as to parentage. The pullets of the family containing the largest percentage of females in it should be reserved for breeding from during the following season, and in turn their families should be similarly marked, and again only the most feminine family should be used to continue the building up of the strain, and so on for several generations.

As regards egg-laying capacity, the original selected hens should, of course, be of good laying strains. As the cock does not affect the sex of the chickens, the males for the breeding pens can all be selected with a view to increasing the egg-laying powers of the strain.

Mr. Oscar Smart has been working for 12 years at this subject, and claims that the results of five years' practical breeding on these lines have satisfied him as to the correctness of the general principle. He concludes thus:—"That a line can be bred in this way upon which you can rely to produce 9 pullets out of every 12 chickens bred I have proved beyond all possibility of doubt. I do not know if a higher percentage than this could be bred by skill and patience, but it is not improbable."

Those interested in the subject should read Mr. Oscar Smart's article from which the above is taken, also his further articles in subsequent numbers of "Eggs."

Breeding on a Farm.

As regards farm fowls, these are often kept as a side line, and the farmer does not intend to spend much money on them. But as the cockerel gives half the strain to the resulting chicks, a great deal could be done in the way of improving the laying qualities of the flock and at small expense by every year selling off every one of the cockerels and buying a few of a really good strain. Three years after commencing this practice the blood in the new stock would only be $\frac{1}{8}$ of the old original strain of the flock, and $\frac{7}{8}$ would be the improved blood, which ought to give a great increase in the egg yield. It would be very desirable to keep on buying cockerels of the same strain but not too closely related.

Number of Hens to a Cock.

For confined fowls, to ensure fertility, the number seems to vary from 4 to 12, or even 14 as an outside number. The time of year makes a difference. An easy rule to remember given to me was, give four hens in November and add one hen each month afterwards, but I generally give more than this.

A cockerel can as a rule do with more hens than a cock. Individual birds vary much, and that is the chief point. If a hen is found with her back stripped of feathers it means more hens may with advantage be added.

Where fowls are kept in small coops, six hens in each, if the cockerel is strong and vigorous it may be found desirable, even as early as January, to keep him one day in one coop and next day in the other coop. This gives the hens some rest, and yet all the eggs may be fertile. In France the usual allowance on free runs is said to be 20 hens per cockerel, but this may be only in the South of France.

Antipathy between Cocks and Hens.

Not infrequently a cock and a hen take a dislike to each other. In this case the hen should be shifted to another pen, as her eggs would be unfertile, there would be no peace in the pen, and the other hens would soon also bully her.

Trap Nesting.

That is, using nests which have doors so arranged that when the hen enters the nest the door closes automatically and she cannot get out until released.

When the hen is released, her leg-band number is noted, and this and the date are at once pencilled on the egg. As regards the laying record, it is convenient to keep a card, with pencil attached, in the fowl house, the card ruled for 31 days and a column for each hen. The egg is then marked up on the card directly it is taken out of the trap nest. These cards are changed every month, the old ones being put away as records. Your records are then the original documents, and you have less chance of forgetting or copying incorrectly.

A daily record of the first two months a pullet is laying should give a very fair idea of her capabilities, but for certainty you must have her record for the whole of her first year of laying.

If trap nests are used they should be visited every three, or at least every four, hours.

Efficient trap nests can easily be made at home. They need nothing complicated.

If hens are trap-nested they become of far more interest and much tamer to handle. It enables you to breed only from hens who are good layers, and thus improve your stock. You know the parentage, strain and date of laying of each egg. You avoid the egg-eating habit, or at any rate you can at once detect the offender. You also know which hens lay the soft-shelled or rough eggs, and you know which hens should be got rid of as laying too few eggs.

You cannot always trust to appearances. We had one hen, her comb used to be red, she was always eating, always healthy and bustling about, she was frequently found in the trap nest, and yet during eight months she laid but one egg. Again, after trap-nesting about 25 pullets for some months, several were between 110 and 125, while three were under 45 and one only 30. These three bad layers might, no doubt, have produced chicks who would become good layers, but the chances seemed better by breeding only from the good layers, and it is only by trap-nesting that you can make sure how much work each hen does.

Trap nests should be high enough to allow the hen to stand fairly upright, as many can only lay in this position. The usual allowance is one trap nest for every three laying hens. If they are kept waiting too long for a vacant nest they take to laying on the floor.

It is no longer necessary to pay high prices for trap nests. The best pattern I knew of a year or so back only cost 3s. 6d. when made by a local carpenter, while now even simpler patterns are available.

The Burn-Murdoch Trap Nest.

(See Figure 11).

A very simple pattern was described in the paper, "Eggs." It was devised by Mr. J. H. Burn-Murdoch, of Great Shelford, Cambridge, who specialises in a laying strain of Black Leghorns. It is largely used at the Hamworthy Poultry Farm, where it is highly spoken of.. The following is a description of it:—

A box, the top or back to hinge open to get the bird out. The bird enters at the front. A bar is fixed across the top of the entrance, about $\frac{1}{8}$ in. below the roof. Through this $\frac{1}{8}$ in. slit there travels a window blind. This curtain blind is broad enough to cover the width of the opening properly, and its length is about the same as the height of the box. At the bottom end (the outer end) of this curtain there is a hem, through which is passed a thick, heavy wire or iron rod. The wire through the upper hem (the inner end) is very much lighter and projects half an inch beyond the curtain on each side.

Within the box, attached one to each side at suitable spots are two catches made of bent tin, something in the form of a hook, with its open side upwards.

To set the trap, take hold of the thin (inner) wire and draw it back into the box until the bottom heavy wire comes against the slit, then catch the projecting ends of the thin wire behind the tin hooks on each side. An important thing is the position of and angle to which these hooks are bent. They must be placed so low down that when the hen gets inside she is bound to push up and dislodge the wire from the catches.

The weight of the heavy wire now drags the curtain down through the slit and thus closes the opening. Suppose the entrance to the trap nest to be a round hole (6 or 7 inches in diameter) in the front side of the box, then this curtain is arranged so as to drop within that front side. As the curtain is held at top and bottom by the wire, and there is a good overlap at each side, it becomes impossible for the hen to push her way out.

Marking Breeding Stock.

To raise a good laying strain and avoid inbreeding you want to know the parentage of the fowls.

The first thing necessary is trap-nesting. By this you know how many eggs each hen lays, and so discover which are the best layers. You also know the exact parentage and strain in each egg.

If the eggs are to be hatched by hens, a setting of eggs, all laid by the same hen, may be given to one hen to hatch out. The exact parentage of that batch of chickens will then be known.

If the eggs are to be hatched in an incubator, partitions can be arranged so as to keep distinct the eggs laid by different hens, these partitions being put in on the 19th day. As newly-hatched chicks very often climb about, these partitions have to come very high up, and therefore should be of open wirework or muslin, so as to allow the heat to get through them and the temperature to be even all over the drawer.

Another way is to make some muslin bags (about 16 in. by 8 in., each having a tape label attached, which is marked A or B or C, etc.). Then on the 19th day the eggs laid by each hen are put in a separate bag and securely tied or pinned with a safety pin. Thus if the eggs were the product of five hens then five bags would be necessary. Four bags might suffice, the eggs of the fifth hen being left loose. But sometimes a bag becomes untied, or a chicken makes a hole in the muslin and gets out, in which case there at once becomes a doubt about parentage unless all the eggs are put into bags. These bags should not be so full of eggs as to crush the chickens when they hatch out.

When the hatch is completed and the chickens are to be taken out, get several cardboard boxes and mark each box clearly A or B or C, etc. Open each bag and place chickens from bag A into box A, etc., covering the boxes with pieces of blanket or clothing to keep the chicks warm until you have toe-marked them all, when they can be all placed together in the cold or hot brooder, whichever is used.

Toe Marks.

Chickens have on each foot three big toes. Between these toes there are on each foot two small webbings. Toe marks consist of holes through one or more of these webbings, but only one hole through one webbing.

Fifteen different toe marks can thus be made, which are taken as representing the figures 1 to 15, or the letters A to O. (See Figure 13.)

Imagine a chicken standing on a table and that you are standing behind him, facing in the same direction that the chicken faces, then as you look down you see the four webbings from right to left.

One hole, and that in the right webbing of the right foot, stands for A; a hole in left webbing of right foot stands for B; a hole in right webbing of left foot stands for C; a hole in left webbing of left foot stands for D; holes through both webbings of right foot stands for E; etc., etc.

Some people work in an extra toe mark (to make up 16) by considering no holes punched at all as a distinctive mark. But this is not desirable, because in case the holes are not watched and close up the chicken comes to be considered as from a certain hen, whereas really it is uncertain what hen it is from.

It is most important to remember, both when marking a chick and also when picking up a bird to read its toe mark, that you must hold the bird the correct way. That is, hold the bird in front of you, standing on its feet, and the bird to be facing the same way as you are; otherwise, that is if the foot is held upside down, or if the bird faces you, then its left foot appears to you on the right-hand side, etc., and the marks all become inverted, and you may thus easily mark the chick incorrectly or read off a toe mark wrong.

Before marking the chicks, a diagram key for reference must be made of the markings you decide upon, and once this is fixed, copies should be made in your diary, etc., that you may always keep to the same marking.

A clear diagram key may be made as follows:—Write down in a column the letters A, B, C, etc., up to O. Against each letter draw two diagrams, one for the right foot and one for the left foot. An inverted broad-arrow (that is, three lines all starting from one point and opening out to the front) makes a good diagram to represent a foot. You can then fill in dots in the diagrams to show where you propose to punch the webbings of the chickens so as to represent each of the letters from A to O. An example is given in Figure 13.

Making the Toe Marks.

Some of the punches sold for this are quite unsuitable as they crush the bones. A saddler's punch pliers should be used, with removable bit, so as to be able to vary the size of the hole. For marking newly-hatched chicks the hole should be 1/16 in., or a shade less. Two people can do it best. One holds the chick, the other, with the left hand, holds a piece of cardboard under the chick's foot, and holding the punch with the right hand guides the pricker downwards on to the web between the toes and then closes the punch.

The hole will be much cleaner if the cardboard is used as the punch goes through the webbing well into the cardboard. The hole should be made as close up to where the toes join as possible, as it is then less likely to tear open, though more likely to close up. If properly done with a saddler's pliers punch toe-marking is in no way painful to the chick.

All these toe marks should be examined in a few days' time, and again at longer intervals, as they are sometimes apt to close up, but not after they have been punched the second time with a larger hole when the foot is bigger.

As only 15 distinctive toe marks are possible, if more than 15 hens are being bred from, the only thing is to keep chickens similarly marked, but of different parentage, in quite separate coops or runs. As soon as the chicken is big enough to have a permanent leg band it should be given its permanent pedigree number, which will always enable the parentage to be traced, and such a permanent leg band is not likely to come off, as may happen to an expanding temporary chicken leg band.

Leg Bands.

I personally had so much trouble in finding an aluminium leg band which was both substantial and clearly marked that, much against my publisher's wishes, I give the following suggestion for those in a similar difficulty. The "Exclo" aluminium interlocking ring, supplied by F. W. Dowell & Company, Mary Street, St. Paul's, Birmingham.

To get all the value out of trap nesting and marking, complete records must be kept, and these very greatly increase the interest in keeping a small flock of of fowls. But even if the records are scanty and the leg bands are not put on until the pullets begin to lay, the toe marks will be a valuable aid when arranging breeding pens to prevent inbreeding.

Regarding leg bands, these always require watching. It is not so very rare to see a leg band decidedly too tight for the bird, even on full-grown birds.

Testing Thermometers.

Sometimes the thermometer supplied with an incubator is not accurate; also it is said that thermometers of ordinary make may vary slightly from year to year. However, it is certainly worth while testing a new one by comparing it with a doctor's clinical thermometer, which your chemist will do for you.

Incubation.

A word of advice to beginners: Whatever make of incubator you have be sure to hold to the instructions sent with it. Visitors often offer advice—give more moisture, give less airing, etc.—but it is to the maker's interest to have sent out the best possible instructions with it, and if it is of a good make you may be certain the manufacturer has tested it all ways.

After the first week try to make sure that only eggs with big, well-growing germs are placed immediately under the thermometer. It is well to mark a few special eggs suitable for this work.

If you have a dead germ or an unfertile egg under the thermometer and keep the heat up so as to get the correct reading, you would be giving too much heat. (A well-growing live germ has considerable heat of itself; an unfertile egg has none.)

It is not considered advisable to have Leghorn eggs and the Asiatic eggs together in the same incubator.

To Help Chicks Out of Their Shells.

Wright, in his book on poultry, points out that when opening shells for chicks who seemed unable to get out by themselves he found he had much greater success if he had a bucket of water heated to 105 deg. and held the egg in this while he was making the opening, and for a minute or two before. To make the opening, find the air space, make a hole in the centre $\frac{1}{4}$ in. across. If the chick's beak is visible through the inner skin of the egg, start cracking the shell round the egg on the line that the chick's beak would follow if he twisted himself round in the egg. This practically cuts off the top of the shell.

Make the big hole with a knife point, guarding with the finger all but the tip. For cracking the shell all round, press the head of a pin against the shell.

Replace egg in the incubator while it is wet.

Incubators.

I have for two seasons used Mr. Philo's pattern, the "Philo" incubator. They are made of metal, simple to work, and gave me very good results. They held 48 eggs each, and are inexpensive. There are two patterns, the "Brooder Hatcher," which contains a warm cupboard underneath, useful for putting early arrivals into until the whole hatch is out, when they can all be removed to cold brooder box or hot brooder, as the owner may prefer. The other pattern is the "Cycle Hatcher," which has no warm cupboard, and is rather cheaper. If one used several incubators it is convenient to have both sorts, say one brooder hatcher to two or three Cycle hatchers. The use of small incubators is advantageous in several ways. They do not take so long fill. In case of accident a very large number of eggs are not wasted; also if two incubators are started together and there are many unfertiles, they can all be put into one incubator and the other started afresh.

Oil for Incubators.

Use the best oil you can get; I have always used White Rose. The following appeared in a recent number of "Eggs":—"Insist on Alexandra or, failing that, Strange's A1 crystal oil.

The quality of the oil can always be ascertained by examining it in a glass or tumbler. The best quality oil is colourless, like water. There should be an entire absence of yellow tint or bluish tint in the oil. The two oils above mentioned will not carbonise a wick, even after it has been running for several days. We admit it is more expensive to buy, but it pays in the end, and the oil is practically safe to use almost anywhere.''

If you are temporarily unable to get the best oil and what you have is apt to be smoky, it is said that some good may be done by adding half a cup of salt to each quart of oil, mix it up and let it stand for a day, then pour all but the bottom part into the lamp and then, if available, put a piece of gum camphor into the oil in the lamp.

Fattening Fowls.

This is quite a different trade to providing winter eggs, but a few notes may be of use. The Americans apparently consider that this art is as well or better understood in England than in America.

For really fattening fowls they are placed in fattening coops (something like a small, narrow broody coop), where they cannot move about. They are at first given Epsom salts (about a saltspoon slightly piled up) and are then starved for 24 hours. After this they are given frequent small feeds of soft mash, the frequency of the meals and the quantity at each meal increasing gradually. The complete process lasts but little over three weeks, as after that time the birds seem to get stale and begin to lose weight.

Thus it is not convenient to really fatten fowls for home use, as they are not then to be all killed on the same day, and would therefore require different treatment for each bird.

As regards a pen of fowls put aside for killing off gradually, something in the way of fattening may be accomplished as follows:—

A cooked mash should be given two or three times a day, but not in very large meals at first. The mash should be steadily reduced as to the proportion of bulky materials, *i.e.*, dry short cut clover and bran, and especially as to the clover. A larger proportion of barley meal or middlings may be added, and linseed meal or fatty table scraps may be given in increasing proportions.

Lean meat would be useless. Milk, especially whole milk, sweet or sour, will be very helpful.

They will not now require such a large grain ration; two-thirds of what they get may now consist of cracked maize or buckwheat. Green food must still be provided, also unlimited clean cold water, and also grit.

Practically no litter is wanted, but only a little earth, say 2 in. deep, and the grains should not be buried as digging for their food would make the birds tough. From five to seven weeks is about the utmost that the birds could stand of this treatment, after that they would get off their feed, but, of course, this depends on how gradually they are brought on to this fattening treatment.

I hear that adding mustard to their soft mash helps them to digest it and so puts off the day when they would begin to go backward.

The fowls would show practically no improvement in weight for the first week, and would probably be in the best condition for killing after between three and four weeks of treatment.

Toughness of Fowls.

For a chicken to come to table tender it should be cooked either within half-an-hour of being killed or else it should not be cooked until three days and nights (72 hours) after it was killed, as the muscles will not have relaxed until then.

A chicken taken quietly out of a coop, killed, prepared and put in the oven within 25 minutes of being killed will probably be tender, but if that same chicken had been pursued round a yard by a dog for ten minutes and then killed and cooked it would probably be hopelessly tough. The reason is, I believe, something to do with the circulation of the blood. Exactly the same thing holds good with a bullock.

Chickens for table should not be made to dig too hard for their living. Two chickens I killed when three months old were very tough and their legs quite uneatable. These had grown up with others intended for breeding stock, and all of them had had to dig for every grain of corn they ate. Incidentally, this was a good proof of the exercise ensured by scattering all grain in deep, dry litter.

How to Kill a Fowl.

The usual mistake is that people try to wring the neck without using any leverage, and simply by the strength of the arms, instead of getting the weight of the body or strength of your legs to help you.

A good way is to sit down, with knees close together. With left hand hold fowl's legs, tail and end of wings; with right hand hold fowl's head, your thumb towards you. Hold the fowl with its back to you just in front of your knees, with your thumb close to the right side of your knee. Get the fowl taut, with your hands just below your knees. Then by bending the fowl's head back, opening your knees and pulling with your arms, doing all these three things suddenly and at the same time, you will give a very powerful jerk, which will leave only the skin as the connection between the fowl's head and body, thus killing it immediately.

Experts do not trouble to sit down, but for the inexperienced the above method is best to ensure killing the bird instantly.

Plucking a Fowl.

A fowl is most easily plucked immediately after it has been killed. If the bird has been dead some hours, or if it is desired to pluck fowls very hurriedly, many people use scalding water to help them. The method is as follows:—Holding by the head and legs so as to keep her level and let the water under the feathers, dip the bird five or six times in boiling water. This will loosen all the feathers so that they can almost be brushed out.

To Make Old Hens Tender.

Two methods are advocated:—

1. After killing immediately bury her, head down and with all her feathers on, and leave her buried for 24 hours.

2. Kill the fowl in the late afternoon. As soon as the bleeding has practically ceased, drop her into a large bucket full of cold water (with her feathers on her) and leave her to soak until next morning.

I have not tried No. 2, but I have several times tried No. 1 and believe it to be effective.

A bird treated thus is best plucked by the aid of scalding, as described before. There is a further treatment which gives the flesh of the old bird very much the appearance of that of a chicken. It is as follows:—After plucking, dip the fowl in boiling water for 15 seconds and then dip in cold water (as cold as you can get) for 15 seconds. Wipe the bird dry, draw the bird, clean and hang in a cool larder for a few days, according to weather. I have not personally tried this treatment, but I am told it considerably improves the appearance of the bird.

Trueeing a Fowl for Table.

Of course this makes the bird more shapely to come to table, but many people, even poulterers, sometimes seem to forget that the main object is to get the bird to remain steady on the dish while being carved, and with some birds this is difficult to arrive at.

The bird rests on its back on the dish, and to be steady there it should rest on both legs as well as its back. That is to say that if, when it was trussed, its legs were not pushed far down towards its back it would when laid on the dish roll from side to side, first resting on its back and one leg and then on its back and the other leg.

The usual method of trussing a fowl is to put a skewer through one leg, inside the joint. Press that leg as far back as possible, then push the skewer on through the fowl, and when the point comes through the bird, press the other leg well down and push the skewer on through that leg.

This matter of getting the legs well back can be more easily arrived at by the following method:—

Thread a big sacking needle with stout string, pass it through the leg, over the back and through the other leg, bring the ends of the string very tightly together and tie securely. (It is on the same principle as the following:—If you wanted to tie a man's elbows well back behind him, this would be better arrived at by the rope all passing behind his back rather than if one thickness passed through his body, as is the case with the skewer.) A skewer may be added afterwards if desired, but it is not necessary. The string should be removed in the kitchen after cooking. Do not use fine twine, or it may get left in the bird and eaten.

This suggestion only refers to the fixing back of the legs, the remainder of the trussing as to wings, tying down of the ends of the drumsticks, etc., can be done as usual.

Loss of Weight by Plucking and Cleaning.

Following results are from 41 average Orpingtons. On the average the plucked bird weighed 6 per cent.

less than the live bird. The bird ready for cooking, but including giblets, weighed 28 per cent. less than the live bird.

Cooking Old Hens.

It is the fashion to look down on old hens as food, but if fat they are by no means to be despised. They have much more flavour than chickens, and if properly cooked, either boiled or roasted, there is no reason why they need be tough.

For people who only keep a few fowls I strongly recommend them to eat their old hens cooked as below, for if sent to market they fetch but little. Those who have many old hens to dispose of should fatten them ready for the big Jewish festivals, at which times old hens fetch very good prices.

To Boil an Old Fowl.

Be sure there is sufficient water in the pot to completely cover the bird and some to spare for evaporation. When the water is actually boiling drop the bird in. If a two-year-old bird, 2½ to 3 hours suffices; if older, from 3½ to 4 hours. The important points are: (1) Do not put the fowl in until the water is really boiling, so as to at once seal up the pores and keep the juices in. (2) The water must never, at any rate after the first two or three minutes, be boiling hard, it must be only simmering. If the water boils hard the fowl will certainly be tough. (3) If the fowl is to be eaten cold it should be left in the water in which it was cooked until it is quite cold. (If it is to be eaten hot, it may, if desired, be taken out of the water as soon as cooked and slightly browned in the oven.)

To Roast an Old Fowl.

Steam the fowl gently for from two to four hours, according to size and age, after which take it from the steamer and roast in the ordinary way, keeping the bird well basted while in the oven.

To be really good eating, an old hen must be fairly plump and really properly cooked.

A Digging Tool for Coops.

(See Diagram 6.)

A convenient tool for digging and loosening the earth in a Philo Coop or other very confined space is a crescent-shaped, turf-edge cutter, fitted with a rather long but light handle. This is plunged into the earth and then twisted sideways with the wrist.

Feeding Boards.

These can be made by cutting up a sheet of corrugated iron sheeting into suitable pieces. Such feeding boards are very easy to keep clean, and if made from a really thin grade of sheeting they are light to handle and easy to cut.

Hopper for Bran or Dry Mash.

(See Diagram No. 5).

I have tried several forms of hopper for feeding bran, etc., but all of them jammed more or less. The most satisfactory device I have found as yet is as follows:—A box with an opening along the top of the front wall; the roof to project to the front about 1½ in., and a bar of wood inside along the length of the box, passing through the ends of the box about level with the top of the front wall and about ¾ in. clear back. This bar is only of use when the fowls are very wasteful, as if they take too big a mouthful it causes a good deal of the bran to fall back into the box. The box is hung by a screw hook at each end. Do not bore holes in the back of the box to hang it by. Such holes cause much waste in emptying and refilling. The projecting lid keeps the bran cleaner, and also much facilitates refilling. All my boxes were made of wood, but I think zinc would be much better, as easier to keep clean. These boxes may be of any length. For 12 fowls and daily filling I found 9½ in. a convenient length. The dimensions for feeding adult birds are given in the diagram. They are *inside* dimensions.

For chickens, I had two smaller sizes, dimensions as follows:—Size 2, 14 in. long, 3½ in. broad (front to back), front wall 4 in. high, opening 2⅛ in. wide; Size 3, 14 in. long, 2½ in. broad, front wall 2¾ in. high, opening 1¼ in. wide. In both Size 2 and 3 the roof also projected slightly to the front.

For chickens, I did not find the cross-bar to prevent waste necessary. To prevent waste, none of these boxes should be fully filled up.

Hoppers for Grit or Oyster Shell.

(See Diagram No. 7.)

Occasionally one sees glorified hoppers with many different compartments. My experience is that these are very awkward to clean without causing waste. I prefer a rough but separate box for each article—grit, oyster shell, charcoal, etc. The boxes may be hung quite close together if more convenient, but separate boxes are much easier to handle, and you do not get charcoal and oyster shell, etc., all mixed up together.

Top Filling Drinking Fountain.

(See Diagram No. 4).

A very convenient form of drinking fountain has lately been devised; I believe it hails from America. It is made of zinc or galvanised iron. It has all the advantages of the automatic supply fountain, and yet it can be easily opened up for cleaning without upsetting the water about. This advantage is secured by the introduction of a tap, which is turned off when it is desired to dismantle the fountain for cleaning or emptying. This form of fountain can be supplied by Mr. Meech.

This may give the idea of it:—Imagine a zinc cylinder (about 10 in. long and 8 in. across), open at top and closed at bottom, having a small tap very near to its bottom. This cylinder stands in the centre of a zinc saucer, to which it is soldered down. This saucer is about 3 in. wider than the cylinder, and its sides are about 2 in. high and upright. There is another cylinder, slightly larger, closed at the top and open at the bottom. This comfortably but easily fits over the first cylinder as a cover, its bottom edge coming right down as far as the tap. If the tap be turned off, the inner cylinder filled with water, the cover put on and pushed right down to the tap and the tap be turned on, the water will then flow into the saucer until it reaches just above the bottom edge of the outer cylinder. The air inside having thus been sealed in by the water in the saucer, the whole arrangement now works as an automatic fountain and the fowls always have a supply of fresh water. Before opening up to clean it out or refill, the tap must, of course, be turned off first, or the water would all run out.

The Burn-Murdoch Water Fount.

(See Diagram 14).

This fount arranges for laying on to the fowl house an automatic supply of fresh water, and it (the fount) only requires refilling once a fortnight.

We are indebted for this arrangement to Mr. J. H. Burn-Murdoch, of Great Shelford, Cambridge, who makes a speciality of supplying eggs of a really good laying strain of Black Leghorns. Every breeding hen on his farm is trap-nested, and as he attends largely himself to the work, he has gone very closely into the question of reduction of labour and has introduced his trap nest and also this water fountain, his last invention.

The arrangement is as follows:—A 20-gallon beer barrel is fixed on a stand close outside the hen house. (This barrel must be absolutely air-tight.) A pipe leads from bottom of barrel into the fowl house, ending in a tap. Under the tap, standing on two wooden battens, is a dog's drinking dish. Under the battens a small sink is arranged with a waste-pipe leading out of the fowl house. On the top of the barrel, for filling it, there is inserted a short piece of 1½ in. tubing, with an air-tight cap to screw on; also a short piece of ½ in. compo. tubing. This compo. tubing fits into a length of garden hose, which curves up through the fowl house wall and leads down into and almost touches the bottom of the dog dish.

If the barrel be filled and the tap be turned on the water will flow into the dog dish until the mouth of the hose pipe is covered, and the air can no longer pass up into the barrel to replace the water, *i.e.*, as in the case of a beer barrel.

The daily work will now be:—Turn off the tap, empty dog dish into the sink, wipe clean, replace in position and turn on tap, for which work one minute more than suffices, and all the daily carrying of water cans is avoided.

On applying to a plumber for an estimate I found that all the fittings are stock articles and would cost 5s.; the labour of soldering and fixing into the barrel would cost another 1s. That is to say, if you supplied the barrel a plumber should find the metal fittings and screw them into the barrel for 6s. (I believe Mr. Brun-Murdoch builds them for less.) The sink, rubber tubing and stand for the barrel would all be extra to the above. The sink need only be of galvanised iron, with the waste-pipe soldered into it, and all roughly made. I also learned that an 18 to 20-gallon barrel in perfect order would cost from 2s. 6d. to 6s. 6d., according to supply and demand.

Explanation of the Diagram.

X = an 18 to 20-gallon barrel on strong stand close up to the fowl house.

A = filling nozzle, with air-tight cap, made of two 1½ in. iron pipe threaded nipples (or one long piece ditto), soldered into a hexagon nut as shown in large sketch. The hexagon nut is attached to enable it to be tightly screwed into the barrel with a spanner. A "dead end" cap forms the cap cover.

B = 8-in. length of ½-in. compo pipe soldered into brass or iron reducing nipple.

C = ½-in. copper or lead pipe and gas tap fitting with same connection as at B.

B L K = length of ½-in. garden rubber hose pipe slipped over B and wrapped air-tight. This hose-pipe must not be less than ½ in. diam. and must pass through fowl house well above the level of the barrel.

D = ordinary round, glazed earthenware dog dish, about 4 in. deep and 8 in. diam., resting on wooden strips over the sink F G, which sink is about 18 in. above floor.

F = a ½-in. lead pipe, draining all emptied water from the sink to out of the fowl house.

Where many houses are fitted with these barrels it would be simpler to fill them by fixing a lead pipe from the water tower into the barrel with a main tap, in which case, to fill the barrel, you merely turn on the main tap and allow water to run into the barrel until it overflows through the rubber pipe B L K.

The water in the barrel remains absolutely untainted, as the tap is some inches above the dog dish and the the rubber tubing contains nothing but air.

The following require attention:—The rubber hose must be (at any rate for the last 10 or 12 inches, nearest the dog dish) at least ½ in. diam., a larger diam. does no harm.

The rubber hose should pass through the wall well above the level of the top of the barrel, 18 in. is about right.

In case of accidents, to prevent flooding the fowl house, the waste pipe of the sink should not be smaller than the pipe from the barrel supplying the tap.

The barrel is well placed if just far enough from the fowl house wall to allow of fixing straw and sacks, etc., around it so as to prevent freezing in winter.

Flower Pots as Drinking Vessels.

Where you have open runs and it would be convenient to use flower pots, get some cement and mix it with sand (half and half) and water, mix to the consistency of thick cream, wet the flower pot and smear it well all over the inside; stand it to dry on a flat piece of board, but see that the bottom is well covered with cement. When this dries it will no longer be porous and the bottom hole will be filled up.

A hole in the ground levered round with a crowbar gives it a firm standing place.

A low packing case, with one side knocked out, placed over it shelters it from the sun and prevents birds from fouling it. If you have chickens or young ducks about, keep half a brick in it to help them get out in case they fall in.

Such flower pots, of a large size and painted blue, green, etc., are convenient to have in a room to stand smaller pots in while a flowering plant is wanted indoors.

Mincing Machine.

Where a few fowls are kept, a good mincing machine that does not get out of order and which does not tear, but really cuts, is very useful. In this, vegetable parings and odd pieces of bread may all be minced up, to add to the wet mash.

It will not, however, be economy to allow anything but outside leaves and potato peelings to be kept for the fowls, otherwise it will be found to be much less trouble for the servants to pass on all partly-used dishes to the fowl bucket, and the household bills will go up. For preparing eggs for feeding chickens, and bullock's hearts, etc., for fowls the mincing machine will save very much time and trouble.

Sieves.

A few sieves of different gauges are very useful for sifting grain, earth, grit, charcoal, etc. In many ways small-sized ones are more convenient. These can be cheaply and satisfactorily fixed up by making a few frames (about 12 in. square) of wood (1¼ in. by ⅞ in.), buying pieces of perforated zinc with different-sized holes and some flat-headed nails to fix them to the wood frames.

Corn Bins.

Empty tea chests made of three-ply wood and also lined with tin are to be found at some grocers. These make convenient corn bins, but the tin lining is so thin that I have known it to be eaten through by rats.

If wood boxes are used it is worth painting the outside with creosote, as rats dislike biting wood for some two or three months afterwards.

A very satisfactory row of corn bins can be cheaply made by using thin, flat galvanised iron sheeting. (This is useful stuff for many purposes, wind screens, etc., and if a complete roll of it be bought it works out at a cheap rate.) A strip of this sheeting is laid on the floor as the bottom for all the bins required. Another strip is nailed against the wall as the back of all the bins. A skeleton framework of wood is now put up, containing also the skeleton frames for the partitions. A long strip of sheeting may now be nailed to the framework as the front of all the bins. Pieces are cut for the ends and partitions, and these are also nailed in position. Covers may be cut and arranged as preferred.

The drawback to this plan is that the bins are not movable.

A Shelf in the Fowl House.

It will be found a great convenience to have a shelf or rough cupboard in the fowl house where a reserve supply of grain, grit, Epsom salts, etc., etc., can be kept. It is also desirable to arrange for a box which the fowls cannot get at in which to place any eggs that have been laid to keep them in safety from egg eaters until the next regular time for collecting eggs, and so save a special journey indoors.

Soil and Drainage.

A dry, sandy soil, sloping gently to the South, and, if possible, sheltered by shrubs, etc., is preferred in England. This both runs the water off and also allows it to soak away and gives the maximum of sun and shelter from cold winds. A thin layer of sand over level clay, or a crust of some impervious stuff is not good. The clay or crust holds the water up, and the sand remains as wet as a sponge. If the birds are to live on the ground it is only certain breeds that can stand a wet soil, and no birds can do well in a run which is all deep mud. However, a great deal can be done by drainage, and often with very little trouble.

In the case of a house or run or coop on sloping ground a horseshoe-shaped drain round the upper part, with the earth piled up and rammed on the downhill side of the gutter, will make an enormous difference, and if you are on clay this gutter should go down through all the top mould into the real clay so that the water may not have a porous soil to drain on through, across and under your gutter, but it will be certain to be led off by the drain. Similarly a garden or small field can often be made very much drier by placing a deep ditch along the upper side of it.

Even in cases where the ground is absolutely flat much may be done by digging a few drains leading to a big hole (2 ft. or 3 ft. cubed) for the water to drain into. If the excavated earth is used to fill up any hollows in the run it will also help. If the rain is continuous it is not a serious matter to occasionally empty this hole with a bucket. Your soil may be such that by jumping a bore hole with a crowbar at the bottom of your drainage hole and exploding a dynamite charge at the bottom of the bore hole you may cause cracks in the subsoil, which will allow your drainage hole to empty itself that way.

When making small gutters on gently sloping ground remember that you can do the work much better and quicker when the ground is thoroughly wet and rain is actually falling. You can then see at once the exact lines that your drains should follow. In this case the ground is soft, you will not need to dig so deep, and you will not disfigure your ground with a number of trenches, half the number of which would have sufficed if correctly placed. It is most difficult during dry weather to dig drains in the really best positions.

Gas or Electric Light.

If either gas or electricity is available I gather it is well worth while fitting these to the larger fowl houses.

You thus get rid of the very long winter nights when it is too dark for the birds to feed after about 4.30. It is, however, not certain that a strong electric light does not in some way affect them and cause a second moult in the early Spring, which is very annoying for breeding arrangements.

If electric light is fitted, a period of dusk (the light turned low) must be arranged for, to enable the fowls to get to their roosts.

Extemporised Fowl Houses.

There are many outbuildings, sheds and odd, sunny corners which could with little expense be converted into really good intensive fowl houses.

A good loose box, facing South, answers excellently, some wire netting being arranged to confine the birds.

I know of one case where part of a stable loft was converted into an excellent fowl house, the light being obtained by substituting glass for some of the slates. Several very large packing cases stood on their sides on trestles against the wall; the roosting perch was inside these packing cases. Thin sacking was nailed so as to hang over the openings, leaving a large doorway. The birds thus had very comfortable sleeping quarters, though the weather was bitterly cold.

When extemporising, if a new wall is being put up, try and get an old window sash to build in; it need not open, but the extra light may be a great advantage.

Dampness is often cured by giving more ventilation.

Extemporised Walls.

These may be made, and even coops built, by building a framework of wood and covering it on both sides with drill or calico.

A wall of two thicknesses of calico, 1½ in. apart, gives a much warmer room than one would imagine.

This is well illustrated in the "Canvasette Coop," which is illustrated in the April, 1913, number of "Eggs." The outer calico can easily be waterproofed, thus giving far better results.

Waterproofing Mixture.

The following is a most satisfactory method for waterproofing canvas, drill or calico, and was the method used for Berthon boats:—

Take 6 ozs. bar soap, cut up small, dissolve and boil in 1½ pints of water. When boiling add 5 lbs. boiled linseed oil and ½ lb. of litharge (patent driers) and 5 lbs. of ochre spruce. When it is boiling and all litharge dissolved it is ready for use.

Be careful the oil does not catch fire while boiling, and have old sacks ready to smother it out in case it does. It is not safe to boil it in a house unless on a closed kitchen range. It should be painted on hot. On calico, I paint as thin as possible, so as to dry quickly. The ochre is only to give body and stiffness and is not necessary for waterproofing. I have used this often, and twice for building canvas boats, but I have never used the ochre. Excellent oilskin capes or aprons may be made by this method.

It dries nicer if done on a hot, sunny day.

Selection of Timber for Fowl Houses.

The hard woods are too expensive. The two soft woods in general use in England are red deal and white deal. Red deal is also known as red wood and as yellow deal. It comes from the tree known here as the Scotch pine.

White deal comes from the Spruce; it is often known simply as deal. For poultry houses and all outdoor work red deal is far preferable to white deal. Even a house of red wood should be painted or treated with some preservative and should be raised off the ground, but a house of white deal would last but a very short time unless heavily painted or tarred, besides being kept off the ground, and even then one is always anxious lest the wood should be taking up the water somewhere..

White deal is very unsuitable for fencing posts, though young Spruces cut for posts will last as well or better than young Scotch Pines. Larch, however, is far preferable to either of the above as posts to place in the ground. White Deal answers well for all indoor furniture. It usually costs from 5 to 9 per cent. less than red deal.

Redwood contains much more resin than white deal, and it is probably for this reason that it is less liable to shrinkage, to warping and to rot from damp than white deal. The outer part of the tree gives a much whiter wood, which is not nearly so durable as the inner and redder, or yellower, wood. This outer sapwood often gets saturated with water while the logs are being floated down to the coast. In this case this sapwood changes to a dark or bluish colour, which is a sign that the wood has deteriorated. Timber which has a large proportion of this blue sapwood should be avoided, especially where strength is required. The sapwood of white deal does not take on the blue discolouration described above.

It requires practice to distinguish for certain between red and white deal. Red deal is of a red or yellowish colour. White deal is more white in colour. Usually in red deal the knots are reddish, they smell of turpentine and are not so hard as in deal; the graining of the wood generally waves round the knots, making easier curves than is the case with deal.

In white deal there are often a large number of very hard, glossy knots, also they appear as if stuck into the plank regardless of the graining. That is, the grain is stopped abruptly by the knot, or goes off almost at right angles until clear of the knot. The fibre also is gnarled or twisted, and often rough near the knots. To distinguish between red and white deal the knots and grain are often a better guide than the colour.

The best red deal has a fairly strong red or yellow colour, the rings of growth do not exceed 1/10 in. in thickness, the wood feels hard and dry, the fibre is stringy, and a shaving from the plane will bear to be twisted two or three times round the fingers. If in decay or deficient of resinous substances the shavings are brittle. With bad stuff the wood feels clammy or woolly, and it easily clogs the saw.

Generally speaking, European red deal is superior to American, while American spruces are better than European. The resinous fluid from the spruce is the basis from which Burgundy pitch is made. White deal should not be used thin, as it is so liable to warp.

See also the article, "Preservation of Wood Posts."

Fowl House to be Built in Sections.

It is desirable to build a fowl house in sections, to be fixed together by bolts. Further, in all except very small houses, the roof, the back and the floor should each be in two or more sections. This greatly facilitates transport and handling; also such a house is not a fixture and is more easily sold.

A Useful Clamp.

When building a fowl house, etc., single-handed, a couple of "sliding, adjustable G. clamps," opening to 8 in., are most useful for holding timbers in position, also for holding a plank in position while planing it when no proper bench is available.

Foundations for Fowl Houses.

There is one form of economy I would most strongly advise: Whatever form of fowl house or coop you may buy, always arrange some sort of foundation to keep it off the ground.

Considerable care must, however, be exercised to ensure that the foundation does not catch the rain running down the walls and lead it into the fowl house. Examine any old fowl house, you will always find that the rot has started along the ground line. For a house kept decently painted or tarred, etc., it is no exaggeration to say that it will last three times as long if placed on foundations which can be renewed as necessary. Even a fairly old house will have its life much prolonged by raising it up off the ground.

Roofs.

A good, durable roof is worth a good deal. It may be obtained by fairly thin planking covered with two-ply weight of ruberoid or similar material. Such a roof will last for years without attention.

The Philo System Book gives, among the instructions for building chicken coops, a method of making coop roofs by tightly stretching material, such as ruberoid, over a frame with no planking at all. If the instructions are carefully followed you get most excellent results, a strong, light roof which a child can handle. A heavy roof to a coop is a continual source of annoyance and danger.

There is a ruberoid cement made with which you can cement patches on in case of an accident causing a hole to be made.

Roofing repairs, the sealing up of draughty walls, and even small, new roofs can sometimes be conveniently arranged by the following method:—Get some tar, heat it and add a little kerosene oil to make it run smother. Tar over the place to be repaired and lay on a piece of calico, or even muslin, put more tar over this and lay on more calico or muslin, or brown paper, and then add a third, and perhaps fourth, coat. A few coats of brown paper laid on thus over some calico with a final coat of tar on the top gives quite a durable substance. The tar should be of the consistency of thickish paint, and it should be put on really hot.

Ventilation and Damp.

Dampness can often be cured by giving more ventilation. A draught would be the quickest cure for damp, but that would not do for the fowls.

If the roof slopes down from the front to the back sufficient ventilation should be available by having the openings on the front side only, but even in very cold climates at least a quarter of the area of the front wall (presuming the length of the front be to the side of the house, as 5 to 4) should be muslin when the shutters are closed. In the South of England more than half the front should be muslin.

For muslin to be of any real use for ventilation it must be the cheap open-woven stuff, and the dust must not be allowed to accumulate on it.

The covering over of ventilation openings with muslin will have a wonderful effect in preventing draughts.

If walls are made of waterproofed calico, etc., do not count on their letting any ventilation through; that must be arranged separately.

I have heard several complaints as to the difficulty of keeping the litter dry in open-fronted fowl houses during the really damp, wet weather of an English winter. This is a serious matter, as it means frequent renewal of litter, which is very expensive.

Top ventilation right across the house would, of course, help much to dry things, but this brings in the danger of draughts, which would certainly be caused by openings in the wall above the roosting perches.

An experiment I propose trying so as to increase ventilation and keep things drier may be roughly described as follows:—Make a box 6 ft. or 7 ft. long, 1 ft. wide, 1 ft. high, with both ends open; nail this box to the roof of the fowl house, inside, with one end just passing through a hole (cut to fit exactly) in the back wall above the perches.

My hope is that ventilation arranged somewhat on the above principle would greatly help a freer circulation of air and yet cause no draughts near the roosting perches, as the openings to these ventilators would be some 6 ft. or 7 ft. away from the back wall.

Concrete Floors.

As regards the floor of a fowl house, it is essential that this should be really dry. Some time back it was urged that either a raised-up wood floor or a concrete floor answered well, but latterly several strongly-worded articles have appeared, written by reliable people, denouncing concrete floors as always being damp. They point out that if a cement floor is used, the only thing to mitigate the evil is to have a layer of four or five inches of earth between the cement and the litter. I have no personal experience of concrete floors. A well-laid stone-flagged floor I used kept very fairly dry. Always remember that no fowls can do well with wet or cold feet.

On further enquiry I have been informed that the dryness or wetness of these floors depends entirely on whether the sand used in the concrete or cement has been thoroughly washed, so as to get rid of all salt in it. On the whole it seems much the safest to have a well-raised wooden floor.

Hinges.

Hinges that disconnect so as to allow of doors, light gates and coop lids being entirely removed are very convenient. Special hinges (lift off) are made for this purpose, but they have the drawback of jamming if rusty. They are not always easy to connect up, and they are expensive.

I have found the following to work well:—Put an ordinary hinge in the vice, file down the head of the connecting pin and knock it out. With a file ease off the entrances to the connections, so that the two parts of the hinge may be easily assembled, pass a big round nail through to form the connection; this nail should be a very easy fit. While screwing a hinge on take out the nail and drive in a wood pin—a tight fit—to form the connection. After the hinge is screwed on, remove the wood pin and the nail is sure of fitting easily. Hinges so fixed have never required changing through rusting tight, and the slight play allowed by such a loose hinge saves the screws from being gradually worked out. I originally arranged this for the roofs of Philo chicken coops, as it was extremely convenient to be able to take off the roof while moving them about; also by having such hinges on both sides of roof and coop I was able to use either side of the coop as the hinging side and thus could open the coop so as to avoid the wind or sun as required. It was only later that we noticed how well this worked for the gates of runs, etc.

Corrugated Steel Fasteners.

These are most useful for poultry carpenters as they save much time and give strong joints. They are especially useful in making such things as the rain screen just described.

Corrugated iron roofing has its gutters about two inches across; but imagine a diminutive form with gutters ⅛ in. across. These fasteners look like small pieces of the latter. They are in various lengths, ½ in. up to 1¼ in., and usually ¼ in. or ⅜ in. wide, and one edge is sharpened for driving in. Three of these make a really strong joint for light work (two on the front and one on the back).

Painting and Tarring.

For roughly estimating the amount of paint required for a first coat on smooth planed wood allow 1 lb. of paint per 25 square feet of wood surface, but this will not allow of its being slapped on thick. Two thin coats dry quicker and are more satisfactory than one very thick coat. For subsequent coats of paint after the first from ½ lb. to ⅔ of a lb. should do for 25 square feet.

If Terebine is used to expedite drying, not more than 1 oz. should be added to 1 lb. of paint. If patent driers are used, do not add more than 1 oz. to 1¼ lbs. of paint.

The following data as regards high-class tarring is from a builder's handbook, but I have not sampled it:—"1 gallon Stockholm tar with 1 lb. of pitch (and if desired 1 lb. of resin) put on hot will cover 12 square yards superficial first coat and subsequent coats should cover 17 yards."

When reglazing a window remember to paint the wood where the putty will come, to enable it to grip the wood. It is not necessary to wait for the paint to dry.

Preservation of Wood Posts.

Slightly, but evenly, char the ends of the posts up to 6 or 8 inches above the ground line (if to stand in long grass, char them further up). The fire should not burn in deep, and no holidays must be left. While still warm, paint with hot tar.

If charred and tarred the results are excellent; tarring by itself is of little use. Charring by itself does much more harm than good. Of course, red deal or one of the harder woods would be used. White deal would rot immediately. Larch is very suitable.

Whitewash.

To prevent whitewash rubbing off, add size. The proportion is ¼ lb. of size to each 2 gallons. These must be mixed while hot.

If size is not available, one big handful of salt to each gallon will do fairly well as a substitute.

A limewash made of quicklime recently slaked in water will of itself kill off all insect life inside the fowl house, but it should be put on hot.

If the whitewash is made of whitening or of lime which has gradually slacked in the open air, then it is necessary to add carbolic acid. The proportion given by Professor Salmon is ¼ lb. carbolic acid to each gallon of whitewash.

Wire Netting.

If you are likely to want to take down wire netting and put up in another place it is more economical to get a stout grade rather than the netting made of very light wire.

The Lantern.

A good lantern burning kerosene oil is useful for night work. Personally, I like a square-cornered hand or dashboard lantern 8 or 9 in. high, with a Barton china burner. The filling of a lantern is much less trouble if the following is provided:—At one of the back top corners of the oil container have a small hole made, and a very short piece of tubing (¼ in. long) soldered on; fit this with a wooden cork. This enables the oil container to be easily and cleanly emptied. Get a small bottle or glass, pour in as much kerosene as the oil container will comfortably hold, and mark the glass accordingly with a file. Keep this glass as a measure. The lantern is now always easily refilled by emptying the oil that remains and pouring in a measureful. You thus get your lamp fully filled, with no need for special care to avoid overfilling.

When a colza oil lantern refuses to burn properly the reason often is that it has been fitted with a solid wick instead of a hollow wick such as bicycle shops supply; also a new wick is, of course, occasionally necessary.

Recipe for Paste.

Six ounces flour, 1 pint water, ¼ oz. glue, 1½ teaspoons of carbolic acid.

Use some of the water to gradually mix the flour to creamy state. Then melt glue in remaining water, stir it up, bring to boil, and boil for five minutes, stirring all the time. Then take off the fire, and mix the carbolic thoroughly in.

Do not use self-raising flour.

This paste sticks well, and keeps good for six mouths, and probably longer.

If ⅛ oz. glue only be used the paste will probably be rather whiter in colour, but not quite so strong. The carbolic acid prevents the paste from going bad.

Aids When Weighing or Measuring.

A bushel contains 2218.19 cubic inches.

A bushel of best oats should weigh 41 lbs.

$1\frac{1}{4}$ lbs. weight of water = 1 pint.
$2\frac{1}{2}$ lbs. water = 1 quart = $69\,{}^{5}/_{16}$ cubic inches.
10 lbs. water = 1 gallon = $277\frac{1}{4}$ cubic inches.
One cubic foot water = $6\frac{1}{4}$ gallons.
1 lb. of kerosene oil = 1 pint.
1 grain a.v.d.p = 1 grain apoth.
1 oz. a.v.d.p = $437\frac{1}{2}$ grains = 16 drams.
1 oz. apoth. = 480 grains = 8 drachms.
1 dram a.v.d.p. = $27\frac{1}{3}$ grains.
1 drachm apoth. = 60 grains.

A halfcrown = $\frac{1}{2}$ oz. a.v.d.p. A penny = $\frac{1}{3}$ oz. a.v.d.p.

A shilling or a halfpenny = ${}^{1}/_{5}$ oz. a.v.d.p.

Two sixpenny bits and one threepenny bit = nearly $\frac{1}{4}$ oz. a.v.d.p.

The average sixpenny bit weighs 42 grains.

The average threepenny bit weighs 21 grains.

Thus a sixpenny bit and a threepenny bit practically = 1 drachm apoth.

A tablespoon holds $\frac{1}{2}$ oz. liquid, or 1 oz. solid.
A dessert spoon holds $\frac{1}{4}$ oz. liquid, or $\frac{1}{2}$ oz. solid.
A teaspoon holds $\frac{1}{8}$ oz liquid, or $\frac{1}{4}$ oz. solid.

60 drops or minims = 1 fluid drachm = $\frac{1}{8}$ fluid oz. = 1 teaspoon about.

Convenient additional weights for 1 lb. or 2 lbs. can be arranged by filling empty wine bottles sufficiently to balance the weight required, corking securely, and tieing a label giving its weight.

Scales for measuring very small quantities can be extemporised by two envelopes of same size hung by a cotton thread to the ends of a small stick, the stick being held up by a string through its centre. Small weights can be arranged by cutting strips off an old mustard tin.

It is sometimes more convenient to measure drugs by making a saturated solution and then measuring out teaspoonfuls of it. Practically anything that dissolves in water gives a saturated solution after soaking 24 hours, and many drugs after 10 minutes, provided always there still remain some undissolved crystals at the bottom. A chemist can always give you the time necessary and the amount that the water can take up, then, with the aid of a little arithmetic, you can easily find how many grains of the drug there will be in a teaspoonful of the saturated solution. For example, permanganate of potash, 3 grains; sulphate of copper 17 grains; sulphate of iron 34 grains, or about half a drachm.

When a 2 per cent. or 10 per cent. solution of anything is to be used it means that of 100 parts of the mixture when made up either 2 parts or 10 parts are of the chemical ordered.

Thus for a 12 per cent. solution of sulphate of copper you might take a pint measure, put in it 12 oz. (a.v.d.p.) of the sulphate of copper, fill it up with water, and empty it all into a basin, etc., and (as there are 20 ozs. in a pint) add 4 more pints of water. The total volume is then 100 ozs., of which 12 ozs. are copper. (The sulphate of copper has to be measured by a.v.d.p., because the 20 ozs. in a pint of water are calculated by a.v.d.p.)

Carbolic acid, 1—100 as it is sometimes written, means a 1 per cent. solution; such would be 1 pint of crude carbolic acid added to 99 pints of water.

Success and Failure, i.e., Profit and Loss.

1. Unless strict economy be practised a fair profit may easily become a bad deficit.

2. Careful accounts must be kept of everything bought and sold, and the items should not all be lumped together, a convenient form of cash book is one with five or more cash columns.

On the "paid" side these columns may be headed: —1, Food; 2, material; 3, new stock or settings of eggs; 4, labour; 5, sundries.

On the "received" side the columns may be headed:

—1, Market eggs; 2, market chickens; 3, stock birds and settings of eggs; 4, sundries.

By dividing your accounts up in this manner it becomes easy, without any analysis work, to see if any item of expenditure is getting unduly large. As regards money received, you will also see what part of the work is most remunerative.

3. If keeping poultry as a business concern (*i.e.*, for other than home consumption only) it is generally considered best to specialise. For example: If your line is the supply of market eggs, keep to that, and do not attempt much in the way of fattening work, but get rid of birds which are not required as soon as possible.

If market eggs is your object do not keep any hens over 2 years old.. Do not attempt to do anything with the cockerels, but as soon as they are recognisable as such get rid of them at once to somebody in the petit poussin line, as fattening and dressing these is quite a trade in itself.

Many authorities consider that for a small egg farm it pays best to buy all the stock, and so avoid the keeping of breeding pens hatching out of eggs and raising chickens.

4. The notes in this book on feeding refer primarily to high-class utility breeding stock, for which the best economy is to give the best of foodstuffs almost regardless of cost. If your object is to produce sterile market eggs only, then very considerable economies may be effected. Boiled rice and roasted cracked maize may be used in considerable quantities, while malt culms and cotton-seed cake meal will quite well suffice to supply the albuminoid element to the birds' rations.

5. An economy which is open to many people is to buy your clover green, and then dry and cut it yourself. Your short cut dried clover will thus work out far cheaper than buying clover meal.

For the man who has 100 birds or more a small chaff cutter becomes a decided economy.

6. It is not economy to spend much time or money over doctoring sick fowls.

7. It is well worth spending a reasonable amount of both time and money in keeping the houses clean and free of all insect life and well disinfected. If you have three or four fowlhouses, it is economy to get a good sprayer. A sprayer that will give a fine mist and remain in good order is cheap at £2, while a common syringe that always wants repacking, that has no power, and that gives no mist, but simply squirts water, is dear at 2s. 6d. The good sprayer will do the work much better and in less than a quarter of the time.

8. Buying houses of thin wood so as to get them cheaper is bad economy. Wood actually $\frac{3}{4}$ in. thick is the thinnest that is desirable. Many houses are sold as of $\frac{3}{4}$ in. wood, but if you measure it you find it is only $\frac{5}{8}$ in., which is too thin; if you expostulate you will probably be told, " Oh, yes; but it was $\frac{3}{4}$ in. before it was planed, and so we call it $\frac{3}{4}$ in.! "

9. If you employ labour the stock you keep should be in proportion. If your stock increases so that you find it necessary to employ a helper, then the stock should be increased so as to fully occupy the helper's time, otherwise it would have been better policy to have done without the helper and reduce your stock to what you could properly manage yourself.

10. Do not keep a single bird that does not, or is not, pretty certain to pay a dividend.

11. Working methodically and in strict accordance with a carefully thought-out time table will reduce the labour on a poultry farm by considerably more than 50 per cent.

12. Do not allow any waste; this means do not put down more food than is required, either of soft stuff or hard grain or green food. Do not allow either sparrows or rats or mice to help eat up your food, and make the food go as far as possible, which means give the soft food thoroughly cooked so that it swells to the

utmost. This one item alone, *i.e.*, "cooked mashes," effects very considerable economy in the food bill.

A failure to make a profit on poultry does not generally occur so much from paying too high a price for things which prove a success, but from spending money on things which prove a failure. In other words, to learn by experience is no doubt a very excellent method, but very expensive.

13. Some people have curious ideas about honesty, and consider a few eggs daily to be only a fair perquisite. Therefore, under some circumstances, unless you have a good lock and keep the key yourself, you cannot be certain that the hens do not lay more eggs than you get.

14. Lastly, I would ask beginners not to at once blame the American system if things do not turn out as they would wish, but to think matters out and try to arrive at the real cause. For example—If a new bird is introduced while he is starting a bad cold, it is only natural that many of the hens should catch the complaint from him.—If chickens are hatched out in July, it is unlikely that they will be laying in November, and the same may be said of hens who pass through the moult late in the autumn.—If your Time Table is such that you have to visit your fowl houses two or three times as often as you would visit fowls kept in a run, it does not prove that American methods necessitate a lot of extra work.

The above examples will suffice, though many more might be given of the unfair charges which are sometimes laid against these new American methods of poultry keeping.

Commencing Poultry Keeping.

To anyone thinking of starting poultry, I suggest the following for consideration:—

1. Read up the subject, and try to get the general hang of it.

2. Write down in the form of questions any points that do not seem clear to you.

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The Diseases of Poultry, by D. E. Salmon, D.V.M., Chief of the U.S. Bureau of Animal Industry, published by Geo. E. Howard, Washington D.C., U.S.A. Its price, I believe, is about 3s. This, I am told, is the standard work on the subject in America, and at its price one of the best in the English language. It is certainly very clearly worded.

Poultry for the Many, 8th edition, published at "Poultry" Office, 12, Mitre Court Chambers, Fleet Street, London, E.C., price 1s. This is an old-established English work. It contains much valuable information I have not found in other books and gives a clear account of the points and history of the various breeds. This last edition was, I believe, printed shortly before these new American ideas reached England, as the book does not deal with them.

The Corning Egg Farm Book. This interesting book describes the great Corning Egg Farm. It is published in America, but Mr. Randolph Meech supplies copies. This is a book that will be chiefly of interest to poultry keepers on a very large scale, but its methods also apply to all followers of the American large flock system.

CHAPTER V.

FURTHER DATA ON FEEDING.

An Experiment in Feeding.

The "Poultry Review" for November, 1911, had a very interesting account written by Mr. E. W. Philo of an experiment he had carried out in Florida. The following gives some of the details:—

The experiment was made with seven hens. It lasted some weeks altogether, but during the last 10 days all foods were carefully measured and exact records were kept. In the earlier experiments it was found that the hens' appetites varied according to the egg production; also that when the dry material for the mash was simply moistened until crumbly and then fed at once, twice as much dry material had to be used than when the mash was allowed to really cook, so as to keep up the same egg supply. The proportions of the mash were:—6 ozs. maize meal, 10 ozs. wheat bran, 1 teaspoon salt, Into this was stirred 2½ lbs. of boiling water. This mash at first appeared very wet, but it soon thickened, and after standing an hour or more it was ready to feed. Thus though only 1 lb. of ground grain had been used, approximately 3½ lbs. of food was prepared, and in a more available form for the production of eggs than when fed uncooked.

It was found that when laying six or seven eggs every day for a week the seven hens ate 24 ozs. of this mash within two hours of its being fed to them, but when they dropped for two or three days to four or five eggs daily then 18 ozs. of mash was sufficient.

During the final 10 days' trial the feeding to the seven hens was as follows:—

About 6.30 a.m.: 4 ozs. of whole oats were buried for them to dig out.

About 9.30: 6 ozs. of sprouted oats (sprouts ½ in. long).

1 p.m.: 18 to 24 ozs. wet mash, as above described.

About 3 p.m., or as soon as the mash was finished: 6 ozs. sprouted oats.

About 5.30 p.m.: 4 to 6 ozs. of mixed grain (equal parts wheat, buckwheat and cracked maize) was scattered in the sand.

In both cases, the mash feed and evening grain feed, the amount given varied according to the number of eggs laid the previous day.

Fresh drinking water was supplied three times a day. The average consumption of this was 3 lbs. a day, or nearly 7 ozs. of water daily per hen.

With 10 days' feeding as above the seven hens produced 54 eggs; the total cost of food was 29 cents (1s. 2½d.). Had ground oats or some laying meal been added to the mash (these were not available at the time of the experiment), Mr. Philo considers the egg yield would have been 10 per cent. higher. One lb. of dry oats gave about 3 lbs. of the sprouted oats as fed.

The summary is as follows:—Seven hens consumed 8⅛ lbs. of dry food material during 10 days, and 6⅔ lbs. of whole oats were used for sprouting, making a total of 14⅘ lbs. of unprepared food. Each hen consumed approximately 12 ozs. of water and raw food material per day (3 ozs. dry food, 9 ozs. liquid).

These eggs were excellent for table purposes, and Mr. Philo considered that had a fertile egg mash been used instead of the mash as described the eggs would have been of a better quality for incubation, and the chicks hatched from them would be easy to raise.

Mr. Philo points out that as the weather was very hot (Florida), and the food was given in such a digestible form, only a little exercise was required, but that in a colder climate less mash and more grain would be desirable. This ends the account of the experiment.

As regards the above data of the experiment, I had some difficulty in getting the figures to agree until it struck me that the total 6⅔ lbs. of oats consumed must have supplied the morning dry whole oats as well as the sprouted oats; allowing that, and also presuming that the daily feeds to the 7 hens averaged, mashes 21 ozs. and evening grain 5 ozs., then a total of 14⅜ lbs. of unprepared food would divide up exactly into the following average daily ration per hen.

Dry whole oats, .57 oz.; oats for sprouting, .57 (after sprouting 1.71) oz.; maize meal for mash, .321 oz.; bran for mash, .536 (mash prepared 3 oz.) oz.

Evening grain mixture, .713 oz.; dry bran during day, .57 oz. This all totals up to 3.28 oz. of dry materials for preparing the hens' daily food.

This would mean that the feeds to the pen of 7 hens would average as follows:—Whole oats, 4 ozs.; sprouted oats, 6 ozs.; mash, 21 ozs.; sprouted oats, 6 ozs.; grain mixture, 5 ozs.; dry bran during the day, 4 ozs.

Chemical Value of Food.

A simple elementary description.

Chemically, all foods consist mainly of:—

I.—*Albuminoids*.—Also called protein; also called nitrogenous foods. These supply the blood, bone, muscles, lean flesh and feathers.

II. *Carbo-hydrates*: III. *Fats or Oils*.—These two are called carbonaceous foods. They consist of sugars, starches, oils, fats. These are what give the bird heat, energy, vitality and fatness.

IV. *Fibre* or husk containing no nutritive qualities.

V. *Ash* or mineral matter, chiefly lime with traces of iron, phosphorous, sodium and potassium.

VI. *Water*, which averages about 13 per cent. in grains.

Albuminoids will, to some extent, do the work of carbo-hydrates, though this entails an extra strain on the digestion; but carbo-hydrates cannot do the work of albuminoids.

For perfect health these ingredients are required in certain proportions. Scientists have lately worked out the following figures as the most desirable proportions of the solid matters of food for a laying hen during hot weather:—

Albuminoids, 10 per cent.; carbo-hydrates, 35 per per cent., fat or oil, 3 per cent.; fibre, 50 per cent.; ash, 2 per cent.

These figures represent the proportions as regards the total of the foodstuffs consumed by a hen during the day.

As regards the 50 per cent. fibre in the diet, the use of this is to fill up the stomach and entrails and so assist these in handling the food and bringing the nutriment in contact with the digestive arrangements. This means that more than half the fowls' food must be of a bulky nature.

As regards the 2 per cent. ash, it is necessary to supply oyster shell, but otherwise in practical work the ash is not much troubled about. Fowls prefer oyster shell rather coarse and not powdery.

The Albuminoid Ratio.

Whenever we wish to compare diets or foodstuffs one of the most important things we want to know is the proportion of albuminoids or non-starchy matter to carbonaceous or starchy matter. Using a shorter term, we want to know the "albuminoid ratio" of the food. The greater the proportion of albuminoids the higher is the "albuminoid ratio" said to be.

The chief feature of carbo-hydrates is starch.

Fat or oil is to some extent a same sort of food as carbo-hydrates but much stronger, partly because it is all digested, which is not the case with carbo-hydrates. Research has proved that to arrive at the total of starch represented in a food, we must multiply the fat by 2.3 (about 2¼), and add the result to the carbo-hydrates.

Thus in the hens' model diet 3 per cent. fat, multiplied by 2.3, gives 6.9, and 6.9 added to 35 per cent. carbo-hydrates gives 41.9, giving, say, 42 as the figure to represent starch. The albuminoids in this diet are given as 10 per cent. The albuminoid ratio of this model diet is therefore 10 to 42—that is, 1 to 4⅕.

This is how the 1 to 4½ or 5 is arrived at as the best albuminoid ratio for the so-called "balanced ration" which we try to provide for fowls (1 to 4½ in summer and 1 to 5 in winter, when rather more starch is desirable).

In looking through a table of food constituents, we find that the albuminoid ratio of most of the grains in general use is too weak (the foods are not strong enough in albuminoids), which is one reason why other things, such as meat, peas, malt culms, clover, wheat bran, which all have a high albuminoid ratio, have to be added to the fowls' diet.

As regards balancing a ration, that is, arranging for the desired proportion of non-starchy to starchy matter, the usual method is to work out the total amount of albuminoids and carbo-hydrates and fats in all the foodstuffs to be fed during a day, and from these find out the albuminoid ratio as above explained, and then, if necessary, make changes in the foods until you arrive at about the proportion of 1 to 4½ or 5.

Choosing Foodstuffs.

For those who may wish to work out balanced rations for themselves, further particulars are given later on.

For those who do not want to do any calculations I have given a few examples of actual diets with the albuminoid ratios which these diets balance out to. A comparison of these diets, and a glance through the analysis table, may help in the selection of foodstuffs, but the amount of water the foods contain must be considered, for example: comparing clover ensilage with dried peas, although these have about the same albuminoid ratio, 1 lb. of the former would not supply fowls with anything like the quantity of albuminoids that they would get from 1 lb. of the dried peas, the reason being that so much of the clover ensilage consists of water.

It is well to remember that the very general fault in feeding poultry is giving them too much starchy food and too little of the albuminoids.

As a rough rule in choosing foodstuffs, make sure that the fowls, especially breeding hens, have plenty of bulky foodstuffs; also that they have a good supply of the foods containing a high proportion of albuminoids, but, of course, within moderation (see animal food, page 40. Of course, green food must also be supplied, but that question is not being discussed here.

Fowls are not likely to be fed too strong in albuminoids unless given much meat, peas, beans, cotton-seed meal, malt culms, pea-nuts, or blood; but if they do get rather too much of the albuminoids they can assimilate it and to some extent make it do duty for fat-forming food, though this entails considerable strain on the kidneys and liver, while a large excess of albuminoids will certainly cause sickness.

If fowls are fed on foods too weak in albuminoids then the hen eats most ravenously to try and collect a little of the albuminoids, and thus consumes more fatty food than she can properly assimilate, even with the hardest exercise. The result is she gets into a very fatty condition, though in reality she is starving for albuminoids; she can lay but very few eggs, and those useless for hatching, as any chickens that do result are sure to be weaklings.

The following table shows the feeding qualities from the above point of view. It shews why plenty of broad wheat, bran and clover are desirable so as to obtain a large egg yield of hatchable eggs, i.e., these two foods are strong both in albuminoids and fibre—that is, they are bulky. The average egg consists of water, 66.1 per cent.; albuminoids, 13.1 per cent.; fat, 9.3 per cent.; ash, .9 per cent.; shell, 10.9 per cent. These give an albuminoid ratio of 1 to $1\frac{2}{3}$, and yet the hens' own food is often very much below 1 to 5, so no wonder she runs short of egg-making material.

Analysis Table of Foodstuffs.

Shewing percentage of various constituents.

	Albuminoid ratio.	Constituents.					
		Albuminoids.	Carbo Hydrates.	Fats or oils.	Ash.	Fibre	Water.
Alfafa (dried)	1 to 3.3	14.3	42.7	2.2	7.4	25.0	8.4
Barley (whole ..	1 to 6	12.4	69.8	1.8	2.4	2.7	10.9
Beans (dried) ..	1 to 2	25.4	48.5	1.5	3.2	7.1	14.3
Bread (dry white) ..	1 to 9	6.9	44.2	0.5	—	—	31.2
Buckwheat	1 to 7	10.0	64.5	2.2	2.0	8.7	12.6
Canary Seed	1 to 4.6	13.8	50.7	5.4	6.8	8.2	15.1
Clover (red dried) ..	1 to 3	13.8	35.9	2.3	6.3	25.7	16.0
Clover (red sweet ensilage)	1 to 2.8	5.6	11.6	2.0	2.3	8.5	70 0
Cotton Seed Cake Mealed(decorticated)	1 to 1.3	42.3	23.6	13.1	7.2	5.6	8 2
Darri	1 to 4.9	15.0	61.5	5.0	1.6	3.9	13.0
Egg (a fresh)	1 to 1.6	13.1	—	9.3	0.9	(shell 10.9)	66.1
Hempseed	1 to 5	16.3	15.0	30.0	4.4	22 0	12.3
Kaffir corn	Practically same as Darri.						
Linseed (whole) ..	1 to 5.1	20.5	19.6	37.0	3.4	7.2	12.3
Lucerne (dried) ..	1 to 2.3	16.0	31.8	2.3	6.8	26.6	16.5
Maize	1 to 8.7	9.2	68.0	5.1	1.4	2.6	13.7

Analysis Table of Foodstuffs.—Continued.

Shewing percentage of various constituents.

	Albu-min-oid ratio.	Constituents.					
		Albu-min-oids.	Carbo Hy-drates.	Fats or oils.	Ash.	Fibre.	Water.
Malt (culms or dust)	1 to 2 1	23.0	42.2	2.5	6.8	17.5	8.0
Millet	1 to 4.9	15.0	61.5	5.0	1.6	3.9	13.0
Oats	1 to 6.1	11.5	58.5	5.2	3.0	9.7	12.0
Peas (dried)	1 to 2.6	22.5	53.7	1.6	2.8	5.4	14.0
Rice (naked)	1 to 9.5	7.6	71.3	0 3	0.3	6.5	14.0
Rye	1 to 6.4	11.5	69.5	1.7	2.0	1.9	13.4
Sorghum	Practically the same as Darri.						
Wheat (whole) ..	1 to 5.7	12.5	67.7	1.7	1.8	2.4	13.9
Wheat Middlings ..	1 to 4.1	15.6	60.4	4.0	3.3	4.6	12.1
Wheat (broad bran) ..	1 to 4.2	14.8	54.9	3.8	5.8	8.1	12.6
Wheat Germs	1 to 2.2	29.4	40.6	10.0	4.5	2.4	13.1
Wheat Bread (fully refined white bread)	1 to 8.1	7.0	55.8	0.4	1.0	0.3	35.5
Wheat Bread (real wholemeal bread) ..	1 to 5.75	9.2	50.6	1.0	1.3	1.1	36.8
Cabbage (green) ..	1 to 4	1 5	5 6	0.2	1.4	1 1	90.2
Grass (pasture) ..	1 to 3.2	4.0	10.9	0.9	2.3	5.2	76.7
Beef (lean)	1 to 1.3	58.0	—	32.9	8.0	—	1.2
Meat Meal	2.4 to 1	72.0	—	13.0	4.0	—	11.0
Blood (dried)	1.5 to 1	65.1	5.3	16.3	6.6	—	6.7
Milk (whole	1 to 4.2	3.2	5.0	3.6	0.7	—	87.5
Milk (separated) ..	1 to 1.4	3.9	4.5	0.4	0.7	—	90.5
Fish (white blooded) ..	2.7 to 1	18.1	—	2.9	1.0	—	78.0
Fish (red blooded) ..	1.2 to 1	10.1	—	5.5	1.4	—	77.0

NOTE.—Tables giving the analysis of foodstuffs vary very much. I have tried to give about average figures.

The Digestion Co-Efficient.

For really accurate work in balancing foodstuffs, the extent to which each constituent of a food is digestible has also to be considered. This is termed the "digestion co-efficient"; this varies for each kind of animal, for each food, and even according to what foods are combined together in a feed. It is therefore a complicated factor to introduce, and I gather it is not essential for obtaining practical working results.

Examples of How Actual Diets Balance Out.

Suppose the mash mixtures described on page 38 were in use, and that the grain feeding in each case was a mixture in following proportion: wheat, 16 lbs.; oats, 8 lbs.; millet, or Kaffir corn, 1 lb. (not that this would be suitable for young chickens). Then these diets would give an albuminoid ratio as follows:—

With summer mash, 1 to 4.7; winter mash, 1 to 5; forcing for eggs mash, 1 to 4.4.

Chickens, 8 weeks to maturity mash, 1 to 4.6.

Suppose the meat to be omitted, but separated milk to be used (1 pint to 1 lb. of dry mixture), the summer mash diet becomes 1 to 5.1 and the winter mash 1 to 5.2. If neither meat meal nor milk were used the summer diet becomes 1 to 5.6 and the winter mash diet becomes 1 to 5.7.

The above is based on the mashes being given cooked, in which case the proportion of mash mixture to grain mixture consumed might be as low as 4 lbs. to 7 lbs. If the mashes were given dry or only moistened a larger proportion of mash mixture would be used, and the albuminoid ratio of the diets would work out stronger in albuminoids, as follows:—

Suppose 7 lbs. of dry mash mixture were used for each 7 lbs. of the grain mixture:

The summer mash diet becomes 1 to 4.3.

The winter mash diet becomes 1 to 4.8.

The forcing for eggs mash diet becomes 1 to 4.

The chickens, 8 weeks to maturity, becomes 1 to 4.3.

The summer mash diet with the meat omitted becomes 1 to 5.5.

The winter mash diet with the meat omitted becomes 1 to 5.7.

The Fibre Question.

As regards the fibre question, it is said that 50 per cent. of the fowls' food should be fibre. The summer mash diet on page 38 only contains about 10 per cent. of pure fibre, but this is only a fraction of that part of the food which acts as fibre by way of giving bulk, *i.e.*, of what passes through the fowl without being digested. If all food consumed were absolutely digested animal manure would not be so valuable as is the case. A horse fed largely on corn and kept very short of hay passes a far less quantity of droppings than a horse fed entirely on hay. This is really a question of digestibility, or what is called the "digestion co-efficient," which is a very complicated matter. The importance of feeding dry clover as regards supplying bulk or fibre may be indicated as follows:—A sheep can extract twice the amount of the nutriment in wheat chaff that a horse can, and yet a sheep can only extract half of the nitrogenous nutriment that exists in clover hay. One thing that is largely extracted from clover hay is the mineral ash, and this is one resaon why clover is such a valuable food.

Dried clover contains about 10 times as much pure fibre as is found in wheat, and I understand that if you include what passes through the fowl undigested clover may be said to contain nearly 20 times as much as wheat.

As a general rule we know that about half the volume of the dry materials for a mash should be on the lines of dry clover, and this on the presumption that for their litter the fowls have straw, of which they then eat a very large amount, and so collect more fibre. Judging by this, it is apparent how badly looked after fowls are when they are confined in a cemented or gravel yard with no straw to get at and with insufficient bulky materials in their mash.

Use of Green Food, Chemically.

The question of green food does not seem to have been scientifically solved as yet. The salts (ash or mineral matter) contained in green foods are an important part of them; the supplying of these salts could, of course, easily be arranged for from a chemist's shop, but this would not give the same results. The only explanation we can get at present is that the salts and other constituents of green food exist in green food in a chemical combination which is extremely beneficial, and that such a chemical combination cannot as yet be manufactured artificially.

Chemical Effect of cooking Food.

As regards cooking foodstuffs, one important effect is as follows:—By cooking a food the starch is converted into dextrin. Now dextrin is soluble in cold water, though starch is not. Thus the food becomes more digestible, and can be more quickly assimilated.

Chemical Effect of sprouting Oats.

The following has been given to me to explain somewhat why sprouted oats are so beneficial for poultry:

In the oats, when sprouted, changes have taken place similar to those taking place in the malting of barley, some of the starch has been converted into dextrin and maltose and become soluble in water and more quickly assimilable, some of the fibre of the cell walls has been dissolved and the contents of the cells liberated and some of the nitrogenous matter has undergone changes and become more soluble. Water has entered into the structure and composition of the oats, and they are much more like the succulent green food which is so useful to poultry. It would appear that the carbo-hydrates especially are more easily and rapidly assimilated after sprouting has taken place.

How to Work Out Balanced Diets.

It adds very much to one's interest in poultry if one can balance out the rations and watch results. This is not difficult provided that that one can do sums in decimals, but a few more words may make the task easier.

First one must realise that when, for example, the analysis table says that wheat contains 12.5 per cent. albuminoids, that also means that in one lb. of wheat you will have .125 of 1 lb. of albuminoids, and so on as regards all the other ingredients.

The proposed grain mixture to be fed should then be written down showing the amount of albuminoids, carbo-hydrates and fats in three columns. Each column is then added up; this line of totals is then divided by the total number of pounds you have dealt with so as to arrive at the amount of albuminoids, etc., in each pound of the grain mixture.

The proposed mash mixture is next similarly dealt with.

You must next decide in what proportion you expect to use up the mash and grain mixtures. Suppose you have always found it convenient, when ordering food, to get 40 lbs. of mash stuff and 70 lbs. of grain, and you accordingly decide on 4 to 7 as the proportion. You then multiply the contents of 1 lb. of grain mixture by 7, and the contents of 1 lb. of mash mixture by 4.

These totals of 7 lbs. of grain and 4 lbs. of mash are added together and become your grand totals.

The fats in the grand total are now multiplied by 2.3 and the result is added to the carbo-hydrates, which should give a figure between 4½ and 5 times as much as the grand total of albuminoids.

If this suitable albuminoid ratio of 1 to 4½ or 5 is not the result, then alterations in the grains or meals, etc., must be made, or some meat must be added to or cut out of the proposed diet until a suitable result is obtained.

The question of sufficient bulk, *i.e.*, fibre, must not be forgotten.

Example of Working Out the Albuminoid Ratio of a diet.

From the analysis table we see wheat has 12.5 per cent. albuminoids, 67.7 per cent. carbo-hydrates, 1.7 per cent. fat. That is to say that in 1 lb. of wheat there is .125 lbs. albuminoids, .677 lbs. carbo-hydrates, .017 fat, etc.

Suppose our grain mixture to be wheat 16 lbs., oats 8 lbs., millet 1 lb., giving a total of 25 lbs.

	Albumenoids. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
Now 1 lb. wheat =	.125	.677	.017
Then 16 lbs. wheat =	2.	10.83	.272
So also 8 lbs. oats =	.920	4.680	.416
1 lb. millet =	.15	.615	.05
25 lbs. of mixture =	3.070	16.125	.738
1 lb. of above mixture =	.123	.645	.03

Suppose our mash mixture to be ground oats 3 lbs., ground maize 2 lbs., bran 2 lbs., dried clover 2 lbs., meat meal 1 lb.

Then 3 lbs. ground oats =	.345	1.755	.156
2 lbs. ground maize =	.184	1.36	.102
2 lbs. bran =	.296	1.098	.076
2 lbs. clover =	.276	.718	.046
1 lb. meat meal =	.71	—	.13
10 lbs. mixture =	1.821	4.931	.510
1 lb. mixture =	.182	.493	.051

Now suppose that 4 lbs. of mash mixture will be used for every 7 lbs. of grain mixture.

Then 7 lbs. grain mixture =	.861	4.515	.21
and 4 lbs. meal mixture =	.728	1.972	.204
The total diet will then be	1.589	6.487	.414
			2.3
			.1242
			.828
			.9522

The fat in terms of starch = .952, which, added to the 6.487 carbo-hydrates, gives total carbonaceous 7.439, which, divided by 1,589 (the albuminoids), gives an albuminoid ratio of 1 to 4.7.

CHAPTER VI.

CHICKENS.

GENERAL REMARKS.

Sunshine and Fresh Air.

It must always be kept in mind that to grow their best young chickens must always have the above, but in summer they also want shade even more.

The yolk is absorbed by the chick the last thing before he leaves the shell. This contains sufficient nutriment to keep him alive for four or five days, though he would be very weak if he got no other food till then, but this shows that he does not require food for some time after he is hatched. A hen never attempts to drive out young chicks to feed, though she will follow them when they run out.

Some people consider that when 48 hours' old is quite soon enough to commence feeding, and some hold that two feeds are sufficient for the first day.

For chicks, give meals regularly and frequently, every two hours at first. Give small feeds. Only leave the food down as long as they feed freely, then take it away, that they may soon begin scratching and be really hungry for their next meal.

Never leave food in the run other than milk, dry bran and whatever chicken grain you may have buried for them.

If when giving a meal they do not seem to want it, omit the following meal so that they may work up an appetite. Endeavour to have them frequently really hungry by day and to get their crops quite full by night time. Feed them sparingly for the first half of the day. About 4 p.m. is the time to begin packing them with food.

It is well not to give young chicks chick feed more than twice a day, so that they may be eager for it and look on it as a treat.

Chickens are often backward through being pecked at by others and generally hustled. If these are put by themselves as a separate little lot they often improve enormously.

Chicks should have a little earth under the litter or they may get on to the bare boards, which is bad for them. They must also have earth at least 4 in. deep to dig in, and it should not be so dry as to be dusty.

If a chick does not work with the others but sits by himself looking sad, examine the head, under the wings and about the vent for lice. The head is perhaps the most likely place, and it may be ticks have got on to it. A dab of lard and paraffin mixed two to one will remove these. Chickens running free or with a hen are specially subject to insect worries.

Overfeeding Chicks.

A chick will grow better if well fed, but if he is given more food than he can assimilate with advantage his digestion (as with a child) will be upset, and unless the food is quickly reduced or changed so as to get him back to health he will get worse and die.

Overfeeding is the chief difficulty that many carefully-tended chicks have to contend with. Two or three days on very little beyond dry bran and green food is the best remedy. Overfeeding is the main cause of leg weakness.

Feeding Boards and Stands for Chicks.

A liberal supply of feeding boards is convenient, as it saves you from frequent washings.

A convenient form is a strip of zinc 14 in. long 2½ in. wide. The sides are then bent over so as to give walls ¼ in. high. The ends should be left open to facilitate washing. It is convenient if all feeding boards are the same size and shape. For the first few days small sheets of brown paper make very convenient feeding boards.

To prevent the water, milk, bran and grit from getting full of earth, these should either be hung to the walls a few inches up and small boxes or blocks of wood provided for the chicks to stand on, or else they should be stood on a block about 1½ in. high.

Drinking Vessels for Chickens.

For feeding water or milk to chickens the following makeshifts may be useful so as to keep the chicks from upsetting or getting into the milk:—

A saucer with an inverted cup standing in it.

A saucer or lid of a cocoa tin with a clean stone standing it it or laid across, or a piece of slate covering most of the surface.

A convenient fountain is as follows:—Get a diminutive jam pot, break out a small V-shaped piece off the top edge, get a 2 oz. tobacco tin (all made in one piece), bend it open so that the jam pot will go in as a tight fit. To use it, fill the jam pot with milk, place tin over it as a cover, and quickly invert, when it will act as a self-filling fountain, the chicks drinking from the corners of the tin bent outwards. If necessary the whole may be placed on a small block of wood with four nails or staples around the tin to grip it steady. This will make it more stable and keep the milk clear of the litter.

Bedding and Litter and Earth Run for Chickens.

For a cold brooder, dry broad bran forms the best bedding, as the more of it they eat the better, and if available I strongly recommend its use, at any rate for the first week. Granulated moss litter also answers very well. Dried clover does well if cut very fine and no hard pieces.

Chaff is often used, but a chick may easily swallow a piece and choke from its getting across his gullet.

The bedding in a cold brooder should be changed about once a week, as it gets damp, and especially if bran is used, because when damp it gradually turns sour.

As regards the run (indoor run, of course), sifted earth not less than 1½ in. deep seems the best for very young chicks to scratch in, but when chickens get to be two or three weeks' old a part of the run should be littered with about two inches of short cut dried clover (lying on half an inch of earth). As they much enjoy scratching about in it, they eat a lot and it does them good, but were they allowed access to it when much smaller they might get chocked, as with chaff. A part of the run must now also be deep sifted earth (three or four inches), as digging in real earth seems to have some special properties for good. The earth should be mellow, not so,dry as to be dusty.

Small chickens will often eat sawdust, so it is not desirable as litter.

Crowds of chickens do excellently with chaff or cavings, both as bedding and litter, but with valuable chicks it seems a pity to take risks.

Chickens should never have access to bare boards, as living on them is apt to cause cramp and leg weakness.

Granulated moss does not seem suitable as litter for them to dig in.

The earth in the run should occasionally be put through a sieve so as to remove the droppings and all refuse vegetable matter.

Absolute cleanliness is desirable for all fowls, but more especially for young chickens, so as to keep them in robust health.

Grit for Chickens.

Chickens require at least two grades before they can use the fowl grit.

To begin with, they want something almost as fine as sand.

By sifting through a bag of chicken grit three grades can easily be secured.

Dry Broad Wheat Bran for Chickens.

This should always be available in the run for every chicken, at any rate until it is two or three months' old, and many say for as long as a fowl lives. Compared to white bread it contains twice as much of the nutriment required for forming muscle, bone and hard meat and it prevents indigestion and diarrhœa.

Broad bran is preferable to ordinary bran because the latter is often of a more inferior quality and contains a great deal of dust. While the chicks are small a convenient way of feeding bran is:—A cigar box with a piece of wire netting (1 in. mesh) cut so as to fit loosely inside. Bran may be at one end and dry clover at the other. The wire netting laid on top will prevent the chicks scratching it all out.

Water for Chickens.

If milk is not available, clean cool water should always be before chicks.

If milk is available, it is better to give only scalded, skimmed or whole milk (the former for choice) during the first three days. On the fourth and fifth days give them one drink of water morning and afternoon, and afterwards always have clean, cool water available for them, even if you also supply milk. The above treatment may help to prevent diarrhœa.

Milk for Chickens.

Be sure to give young chickens milk either whole or skimmed or tinned or dessicated. For the first few days skimmed and scalded is best. Certainly give it for two or three weeks, and longer if you can. After two or three weeks they can safely drink sour milk.

Though sour milk is good a sour mash is not wholesome. To feed the milk procure some form of vessel from which the chicks can drink, but which they cannot stand in and so get milk all over them.

If milk is not given or is discontinued some form of meat becomes desirable.

I have heard of losses among chicks being traced to preservatives in the milk which apparently are very bad for young animals. This may have been the cause of some trouble I once had which I was quite unable to account for. At any rate, it seems desirable to try and avoid preservatives for young chicks.

Eggs as Food for Chickens.

Though a good first food for chicks, they are a strong food and should not be fed too rich. One egg mixed with either crumbs or oatmeal should suffice for 50 chicks for one or two days. They may be used either raw or hard-boiled, as described under " oatmeal " and " bread crumbs."

In case of diarrhœa a free use of hard-boiled egg is helpful, but it should not be continued long, as it often causes the passage to get clogged with dry excrements. Unfertile eggs from the incubator can be used.

Bread Crumbs.

When expecting a hatch of chickens it is well to prepare a tin full. These are easiest prepared by baking the crumb of bread until quite dry and crisp, and then crushing them, but not quite to powder, by rolling a bottle over them. If these get soft, a few minutes in the oven will freshen them up. These bread crumbs are useful for mixing two sorts of food. I. Breadcrumbs slightly damped in new whole milk just before being fed to the chickens. II. Bread crumbs and hard-boiled eggs: The eggs should be chopped fairly small, and are then easily worked into the bread crumbs with a fairly stiff table knife.

Oatmeal for Chickens.

This is excellent for quick growth. Always give young chickens at least one meal a day of plain, dry, coarse oatmeal.

A very good and easily prepared food for the youngest chickens is coarse oatmeal mixed up with raw egg. The yolk and white are mixed together, and oatmeal is stirred in until the egg will take no more. This food is better if allowed to get almost dry before feeding. It will keep good in a tin for two or three days. Coarse oatmeal, which has soaked five minutes in sweet milk, is an excellent food, but it may turn sour in a few hours.

When buying oatmeal taste it to make sure it is sweet, and see that it is coarse; also only buy in small quantities, as it easily turns sour.

Bread and Milk.

When chickens get to two or three weeks old, and even before, it is quite unnecessary to give the fine bread crumbs; stale bread, preferably wholemeal or brown, soaked in sweet whole milk and squeezed dry, answers every purpose, but it should not be sloppy.

Bread and milk should be continued until they have mash feeding.

Green Food for Chickens.

Begin feeding this in moderation to the chicks when about five to seven days' old unless the weather is very hot, in which case they are glad to make a start on the third or fourth day. Very early chicks sometimes will not touch it for the first fortnight.

The sprouts of sprouted oats cut up small with scissors are excellent. Clover may often be found growing thickly on parts of a lawn or pasture; this, cut up small, is also an excellent thing to start on. Lettuce is good, but sometimes it is bitter and they won't eat it. Sometimes they take very kindly to mustard and cress.

Chickens over two weeks old can safely be given mowing machine cuttings, cabbage, lettuce, water cress and, if nothing else is available, rhubarb leaves, but they must have sufficient green food.

Animal Food for Chickens.

If dry broad wheat bran and milk are given freely meat is not necessary. If a bought chick grain feed is given there will probably be a little granulated meat in it. When chickens get to three weeks old a little lean, cooked or raw meat does help them on, but it must be in moderation. As to stating a definite amount, chickens vary much; some at three weeks are not more forward than others at ten days. Anyway, for a three-week-old chicken one worm daily the size of an ordinary wooden match should do nothing but good. I have fed chickens two to three weeks old for four or five days consecutively with three to six worms each and I saw no signs of any harm done, but a longer spell might have caused sickness, for it must have been much more than they could have averaged with a hen.

In cases of chickens growing too fast for their legs, a reduction of starchy foods and some lean raw meat often helps them. If milk is not given meat becomes necessary, and probably the least trouble is to add best fine granulated meat to their grain mixture, say 3 per cent. for chicks under one month and 5 per cent. for older chickens.

Charcoal for Chicks.

Two of the leading American poultry men consider it essential for the health of their chickens that at any rate up to the age of three or four weeks one of their soft meals should daily be well powdered with chicken charcoal. Chicken charcoal is the finest grade, almost a powder. This treatment is to prevent diarrhœa and keep digestion in good order. In the U.S.A. it is a common practice to keep granulated charcoal always before poultry in the same way as grit.

Chicken Grain Mixturee.

It is desirable to have two mixtures—a chick feed and a chicken mixture.

In a chick feed the wheat and some of the larger grains are crushed, as this makes it more easily digestible. After three or four weeks the chicks should gradually be accustomed to a chicken mixture in which the wheat is whole; were they always fed with crushed grains their digestive organs would not get sufficient exercise.

Chick feeds contain much crushed grain, and are therefore very liable to become damaged while in store, especially in hot, damp weather.

When buying a chick feed see that it smells sweet and tastes sweet, especially the wheat and grouts; also see that it has been well sifted and cleared of dust, also examine it as to the amount of flint, grit, rice, and maize in it.

The drawback of many chick feeds is that they contain so much of these three ingredients. Uncooked rice is very insoluble and difficult to digest. Much maize is not good for chicks; many poultrymen refuse to give their chicks any of it. Climate makes a difference, and possibly in Aberdeenshire a fair amount of maize may even be desirable; but in the South of England they are better without any.

At present both rice and maize can be got cheaper than most grains; the dealers therefore like to use them freely. A free use of flint helps the dealer still more in keeping down his price.

From the above it is clear that the lowest-priced chick feed does not always mean the best value for one's money. Of course, flint is heavy stuff, but a certain well-known chick feed of to-day contains over 40 per cent. of flint, maize, and rice altogether.

As chick feed is liable to spoil, do not buy very much at a time.

When making home-made chick feeds remember that in good commercial chick feeds some of the grains used —notably the buckwheat and darri—are specially small of their kind, and similar small grains are not always procurable separately at a retail shop.

This difficulty is easily overcome by using canary seed and millet for the first few days. When four or five days old chicks do perfectly well with a mixture made of grains of the size usually procurable, though, of course, the smallest grains available of each kind would be selected.

If grit is added to a chick feed it should be the finest sifted out from ordinary fine chicken grit. As regards the proportion in which to mix the grains, the following may be useful; it shows the proportions used in one of the high-class chick feeds on the market, but it is not a low-priced one.

	lbs.
Cracked wheat	42
Small darri	11
Red and white millet	8
Peas cracked very small... ...	7
Canary seed	5
Cracked groats	5
Small French buckwheat ...	4
Small hemp	4
Small linseed	3
Maize cracked very small ...	3
Cracked rice	3
Finest granulated meat	3
Split lentils	2
	100

As regards simplifying this for a home-made mixture, I should cut out the maize, rice and lentils; if a really small buckwheat were not available I should also cut that out. If a really good fine granulated meat were available then the meat might be slightly increased and the peas cut out, or *vice versa.*

Following out the above, and being a little generous with the millet and canary, we arrive at—

	lbs.
Cracked wheat	14
Darri or Kaffir corn	3
Red or white millet	3
Canary	3
Cracked groats	2
Hemp	1
Linseed	1
Best fine granulated meat ...	1
	28

If the meat did not seem absolutely reliable and fine I should use 3 lbs. of finely-cracked peas instead, but though it would mean more trouble, I would prefer to leave out both cracked peas and granulated meat and instead give a few worms or some finely-chopped fresh lean meat about three times a week. As an idea of the amount of meat to give: For chickens from four to eight weeks old an average of $\frac{1}{5}$ oz. raw lean meat per chick per week corresponds roughly to 4 per cent. of meat in the chicken feed.

At present prices an average grain dealer would give you 14 lbs. of the above mixture for about 1s. 10d., which means at the rate of 14s. 8d. per cwt., though a whole cwt. could be bought for less, and it would be all eatable, *i.e.*, no grit.

In arranging chicken mixtures whole wheat takes the place of the cracked wheat of the chick feed. Considerable economy can be made by reducing the millet and canary, and as soon as the feathers have grown linseed becomes quite unnecessary.

Where economy in feeding is all-important the following is satisfactory as a grain feed for feathered chickens, but for valuable birds I should prefer the former mixture.

	lbs.
Best whole wheat	3
Tail wheat	7
Cracked peas or cracked Indian gram answers well	3
Buckwheat	2
Red darri or Kaffir corn	5
White darri	8
	28

Housing and Rearing of Chicks.

There is no royal road for this. Different people have different ideas; some prefer hens, some a hot brooder, some a cold brooder.

Unless you are dealing with hundreds of chicks it seems to me that with the aid of Philo chicken coops and cold brooders you can give more individual attention to the chicks with less trouble and time than by other methods. This Philo chicken coop is described later on in the book. I will now give a short account of a method I have found satisfactory.

For brooding the chickens (even when first taken from the incubator) I use a cold brooder—a box 18 in. square arranged exactly as described in the Philo system book.

For the first ten or fourteen days, and longer in winter, the cold brooder stands in what we call the chicken cabinet, which lives indoors on a table and, if possible, at a south window.

After the chicken cabinet is done with the cold brooder lives out of doors in a Philo chicken coop (see Fig. 3), which must be placed facing south. It would not be safe to keep a cold brooder box in a coop that was not on the lines of Mr. Philo's pattern or, at any rate, specially adapted to the purpose, except in really warm weather.

Management of Cold Brooder Box.

The cold brooder, if 18 in. square, can hold 50 newly-hatched chickens. When 10 days' old 25 will fill it. Too few newly-hatched chicks should not be put in a cold brooder, or they will not have sufficient warmth. I have brought up only 7, but 15 seems the very minimum desirable; 25 or 30 is much better, and 50 is not too many.

Dry broad bran is the best bedding for the brooder box for the first 8 or 10 days; but granulated moss litter also answers well. After 8 days short-cut dried clover may be used, as they are not then so likely to choke themselves while eating it. At first the brooder box should be filled with bran almost up to where the quilt comes; it is then pressed down in the centre to form a nest for the chicks. Until about two weeks' old the quilt should actually rest on the chickens, touching them well. As they get older and want more room give rather less bedding, and prop the quilt higher up.

For the first few days they always lie as close together as possible, but, generally speaking, if at any time after the first three or four days on opening the brooder you find the chicks have been huddling extra close together, and especially if in a corner, it means the quilt is not sufficiently low down onto them, or else they would like a thicker quilt or one more thin one added. If they are found crowding up to the doorway it shows they want more air, and would like a lighter quilt, or the quilt to be raised slightly higher above them.

For the first three or four days the chicks should be confined in the brooder box, and only be lifted into the run for meals, and then be put back again. This unless the weather is warm or they are quick to learn their way in and out. The door must never be closed by anything that will stop the air going in; for a door use perforated zinc, or else block up the inside with bran, but not tightly packed.

Chicks will have to be driven in several times before they learn to go in by themselves. If you have some other chicks who have already learned the use of a brooder one or two of them during a day's visit would quickly educate them. A big batch learn much quicker than a small batch, because whenever one runs out several others follow; in a very small batch this means the brooder cools down and offers no attractions, but with a large batch there are always sure to be a good many inside keeping it warm, which the chicks outside seem to find out.

Chicks are apt to huddle in any corners they can find. For this reason it is well to keep the corners of the brooders well packed with bedding, and it would be a good thing to have four triangular boxes with which to block up the corners in the chicken cabinet.

The quilts must always be kept porous to let the hot air through; whenever they get damp they must be dried, and they must be kept free of dust.

After a few days, when the chicks begin to use the doorway of the brooder box, it will be found convenient to get a small box about 5 or 6 in. long by 3 by 2. Knock out one side, and put this small box inside the door to keep the bran from falling out of the doorway. The side of the small box next to the door has been removed so the chickens can walk inside the brooder, and if a step is arranged it will much help the chicks to climb up on to the bedding; but this little staircase box must not be used for the first few days until they begin to go in and out through the door.

Sleeping Box for Chickens.

Chickens who are accustomed to a brooder box always like sleeping in something of that sort until they are big enough to roost. This fact comes in very conveniently, for when the chicks are five or six weeks old it becomes no longer necessary to keep them in a real Philo coop, but they may be kept in any form of fowl-house so long as they are provided with a box to sleep in on the lines of a brooder box, say a box 2 or 2½ ft. square by 1 ft. high with warm bedding in it, a hole in the side, and a rough frame covered with one or two thicknesses of sacking on the top to keep in the warmth, but allow of ventilation.

The Chicken Cabinet.

(See Fig. 8.)

This was a box 4 ft. long, 19 in. wide, and 9 in. high. Thus the 18 in. square brooder box stands in it—an easy fit.

This cabinet stands on a table, if possible, at a south window. It contains the brooder box, the remainder of the cabinet constitutes the run, and is covered with an inch of sifted earth. To help teach the chicks to find their way in and out of the brooder box for the first few days it should be pushed up to within 6 or 7 in. of the end of the cabinet next the window, thus giving the chicks a run of only 18 by 6.

It is a great improvement to the cabinet if the end next the window is glass instead of wood, so as to give more light.

If there are cats about a rough frame should be made covered with ½ in. wire netting for a top covering. If battens of wood are nailed outside, and projecting an inch above the long sides of the cabinet, then the wire netting frame can rest on the box-sides, and, being kept in position by the battens as guides, it can be slid forwards and backwards, which is a convenient arrangement. If the chicken cabinet is to live in a cold outhouse cover the wire netting frame with muslin to help keep the warmth in. It is much more convenient if the wire netting sliding frame is in two halves, because if the cabinet is placed close to a window you will not have room to slide it far in that direction.

Preparations for the Chicks.

Clean and disinfect brooder box and chicken cabinet in time to allow of airing; also scald troughs and drinking vessels. Fill brooder box with bran or fine moss litter, and see that these are dry.

Put sifted earth in chicken cabinet.

Get ready or arrange for all foods, etc., *i.e.*, dry broad bran, finest grit, bread crumbs, coarse oatmeal, baby chick grain, eggs, scalded skimmed milk; also a supply of sheets of brown paper 10 in. by 8 in. to use as first feeding boards.

Treatment of the Chicks.

First Day.

For the first twenty-four hours and more the chicks want nothing but rest, and they are much better left alone. During this time and longer they are living on the yolk which they absorbed just before leaving the shell. When sufficiently rested they commence picking about for food, and as they have bran for bedding there is no fear of their starving.

Second Day.

As soon as the chicks seem anxious to move about lift them out into the run, where a very small feed of breadcrumbs and egg and a little grit should be ready on a sheet of paper.

They may want to drink milk or they may not. After a few minutes put them back in the brooder.

Repeat these meals about every two hours. If milk is not available they must have water.

Third and Fourth Days.

Continue frequent meals, varying crumbs and egg with crumbs and sweet whole milk, teach them to eat dry oatmeal, and bury a little chick feed for them to scratch out.

Gradually leave them out longer at feeding times, but put them back when they begin to huddle and squeak, as this means they feel cold.

If they are given a last feed at 10 p.m. by lamplight this longer feeding day will considerably accelerate their growth. On the third or fourth day fit in the little "staircase box" and usually lift them out, but drive them in through the doorway to teach them the way in. On the fourth day begin giving water, but in moderation the first day.

Remember chicks like a very early breakfast, and as they live indoors this can be done before you dress.

Fifth to Tenth Days.

Continue frequent meals.

Discontinue crumbs and egg after the fourth day.

Vary meals between crumbs and milk, dry oatmeal, and chick feed.

When five or six days' old begin feeding sprouted oats, sprouts cut up small. Be sure they learn to dig. Keep milk always in the run.

Continue the 10 p.m. feed until ten days' old unless they absolutely refuse to eat so late, which they sometimes do as they get older.

As soon as the chicks know their way in and out of the brooder (generally in four to seven days) the doorway is left open all day so that they may run out and dig for a few grains whenever they feel inclined. When the chicks are really educated the door is also left open at night, but the first morning after doing this pay them a very early visit to see they are all right. After this your early visit to give them breakfast will not be necessary, as you can overnight leave some oatmeal or grain in the run for them to begin on, but be on the look out for mice, who may thus be attracted.

The ease with which chicks can be looked after day or night in any weather is the object of the chicken cabinet, as otherwise the brooder box might live in the Philo chicken coop from the very first. This period, while in the cabinet, is perhaps the most important of all for giving chicks a good start in life. For the first two or three days they want plenty of rest and but little food, and once they reach ten or twelve days' old in really robust health they may almost be considered as half reared.

Feeding after Ten Days Old.

It is well to keep to two or two and a-half-hour feeds till three weeks old or longer. Give the same diet, except that stale bread may gradually be used instead of bread crumbs.

Green food will figure more—at least twice a day.

Give milk to drink at least till two or three weeks old. As soon as milk is discontinued some meat should be given. Even with the milk also, when two weeks old a piece of worm the size of a match given every other day, or cooked or raw lean meat, will help them on; but do not overfeed meat, and none of it is necessary if they have milk and bran.

On reaching ten days old, or even before, the brooder box should on sunny days be carried out to the Philo chicken coop and left in it for a few hours to give them fresh air and more sunshine. When they start wet mashes be sure that all the clover gets thoroughly moistened to soften any stalks, the drying-off being done with the bran. The remains of all meals ought always to be taken away the moment they cease to feed freely.

Watch the chicks very carefully from the second to sixth week, as during this time they put on fat very easily, and are very liable to go wrong from overfeeding.

Summary of Management for Chicks.

1. For first twenty-four hours or more leave chicks to sleep in peace.

2. The first few days confine chicks to brooder box, only lifting them out for meals; but commence very early driving them back through the door to educate them.

3. Never feed in the brooder box.

4. Give frequent very small meals.

5. Take away remains of meal as soon as they stop feeding freely.

6. Never leave soft or green food to go sour.

7. Dry bran to be always before the chicks—always.

8. If you can give milk give no water first three or four days; afterwards to be always available.

9. Give scalded skimmed milk first week, and skimmed milk till three weeks.

10. A little finest grit scattered first day of feeding; afterwards always available.

11. A few grains chick feed should always be buried in the earth, but only a few grains or it loses its object.

12. Do not feed hard-boiled eggs alone; they cause constipation.

13. If diarrhœa occurs feed hard-boiled eggs alone.

14. If leg weakness appears reduce all food very much except bran and green food.

15. When chicks know their way in and out the door of brooder box can be left open all day, and soon at night also; a feed of oatmeal or grain can now be left near the door overnight ready for early breakfast.

16. The object is to keep them fairly hungry all day, but to get their crops packed full by night time.

Table of Chick Management.

	1st day.	2nd day.	3rd and 4th day.	5 to 10 days.	10 days to 3 weeks	3 to 8 weeks.
bedding ..	Bran or moss litter till first change.	Bran or moss litter till first change.	Bran or moss litter till first change.	Bran or moss litter till first change. Moss litter or fine cut clover.	Moss litter or fine cut clover.	Moss litter or fine cut clover.
Run.. ..	Sifted earth only.	Sifted earth only.	Sifted earth only.	Sifted earth only.	Part earth part short cut clover.	Part earth part short cut clover.
Water ..	Sleeping	Not if milk is given.	Not if milk is given.	Yes.	Yes.	Yes.
Milk.. ..		Skimmed and scalded.	Skimmed and scalded.	After 7 days Skimmed only.	Skimmed.	Desirable, not necessary.
Grit.. ..		Finest in moderation only.	Finest always available.	Finest always available.	Fine.	Fine to coarser
Broad Bran		Always to be available.	Always to be available.	Always to be available.	Always to be available.	Always to be available.
Charcoal (not essential).				One meal powdered each day.	One meal powdered each day.	Granulated available.
Meals ..		Every 2 or 2½ hours.	Every 2 or 2½ hours.	Every 2 or 2½ hours.	5 to 7 times or more.	5 times or more
Breadcrumbs and egg.		Yes.	Yes.			
Breadcrumbs and Milk.			Yes.	Yes.		
Dry Coarse Oatmeal.			Yes.	Yes.	Yes.	Up to 4 weeks.
Bread and Milk					Yes.	Up to 4 or 5 weeks
Chicken Grain			Finest.	Finest.	Finest.	Coarser.
Sprouted Oats				Once a day.	Once or twice daily.	Once or twice daily.
Meat ..					If no milk give meat.	If no milk give meat.
Mash ..						After 4 weeks.

Of course, very many chickens have grown up to be splendid fowls without all this care, but very careful treatment, more especially for the first two or three weeks, will greatly increase your percentage of well-grown young stock.

Note Quick-Growing Chicks.

Breeding hens should first of all be full of vitality. If they have this quality it is fairly certain that they have had it all their life. With grown birds it is not so easy to at once pick out these birds, but with a batch of chickens only a few days' old there are generally a few which seem considerably ahead of the others—always hustling about eating until their crops are stretched tight and generally taking the lead of all the others. If such chicks grow up without any illness, and do not get a set-back, they will certainly become valuable birds to breed from. It is therefore well worth while to mark a few such chicks in each brood, and keep records as to how they progress.

Chickens in Confinement.

Strong healthy chickens can be reared altogether in total confinement, but if one has the ground available and the chickens are for breeding stock I should prefer to rear the chickens in confinement until they are some two or three months' old, by which time they should be able to fend for themselves. From that age until they are just about to lay I should like them to run as wild as possible, as on a farm, only be sure they have green food, water, digging exercise, plenty of food at evening and shelter they can get to, in the same way as they would get all these on the usual farm. Then when about to start laying collect them into houses and keep them confined.

If chickens are being reared for table, they will grow quicker in confinement, and unless made to dig too hard they will be more tender than the chicken who has had to roam far and wide for his food.

Chickens not to Roost.

Do not allow chickens to roost on perches until about three months' old, crooked breast-bones are said to be largely due to using perches too young.

Separate Cockerels and Pullets.

As soon as one can decide which are cockerels and which are pullets they should be kept apart, they will then grow quicker.

To Tell the Sex of Chickens.

Generally speaking the pullets feather quickest; those that grow long tails are usually pullets. Cockerels generally have a bigger and reddish comb, and pullets a pink comb. With some of the heavier breeds, especially Croad Langshans, one may have to wait well over two months to be certain, and then sometimes the only certain indication is that the feathers on centre of back just above the tail are blunt-ended in the pullets and fine-pointed in the cockerels.

It may be said that cockerel chicks have bushy tails, while the pullets have effeminate heads.

Growth of Chickens.

As statistics as to rate of growth and also as to the amount of food that chickens eat are not easy to find, I give the following as better than none, but these are only from records I happened to keep about one brood of Buff Orpingtons. They were a very successful brood, but ordinary stock of no particular strain:—

Average weight: When four weeks' old, 7 ozs.; at six weeks' old, 12 ozs.; at two months, 22 ozs.; at 11 weeks, 34½ ozs.; at three months, 44 ozs.

The object of giving the above is that it shows something as to relative weights, namely, the average weights at one, two and three months' old were as 1, 3 and 6.

The food these chickens eat averaged per chicken:—During first month, 24 ozs.; during second month, 45 ozs.; during third month, 82½ ozs.; a total of about 10 lbs. in three months. This did not include green food or milk or breadcrumbs.

Petit Poussins.

These are chickens weighing from ½ to ¾ of a lb., and are usually killed at 9 or 10 weeks' old. They have, of course, been fed for fattening. The season when they are in demand is from Easter till the end of June. I believe it pays well, but it is quite a special line, as one would not care to kill off any chickens promising well as breeding stock, while delicate chickens would not stand the fattening process.

Packing Day-Old Chicks.

In a recent article in "Eggs," Miss L. Mulroney points out that live baby chicks travel very much more comfortably if sent in a box made for the purpose, with good ventilation at the top. "The box should be carefully lined with hay, shaped like a nest, so that the chicks can comfortably snuggle together, not overcrowded, but close enough to keep warm. Then a square of felt or flannel ought to be loosely placed over, resting on the chicks, but nailed each end to prevent it slipping down as they move about." The box lid is then fixed on, and they should be clearly marked "Live chicks." Chicks should not be sent off until they are quite dry and have had a few hours' rest before packing. On arrival it is well to place them for ten minutes before the fire in a low-sided box that they may stretch themselves, and be sure to give some milk or water and dry chick feed at once, as they are sure to be thirsty after their journey.

Feeding Chickens to Prevent Diarrhoea.

Dr. J. C. Hartzell, of Ohio, U.S.A., gives in the "Poultry Review" the following diet for chicks as having overcome bowel trouble.

No food but dry bran is given until the third day. On the third day give an onion mixture morning, noon and night. This is fed until they are three weeks' old. From the fourth day on give baby chick feed in the forenoon and afternoon. Give no water as such until the fourth day, as the moisture from the onion is sufficient. On the fourth and fifth day give one drink of water in the morning and one in the afternoon. On sixth day give free access to water.

The onion mixture is made as follows:—

One large onion and two or three small ones, also six hard-boiled eggs (shell and all) are minced up in a meat grinder. These are placed in a two-quart receptacle. Dry wheat bread is then minced up in the same grinder, sufficient to fill the receptacle, thus making two quarts of the mixture. These three ingredients are thoroughly mixed, a tablespoon of baby grit and a tablespoon of fine charcoal are added and the whole is mixed again. No milk or water is added at all to the mixture, which gets sufficient moisture from the onions. The bread must be thoroughly dried, the onions must be sound and all husk removed from them. Clear eggs from the incubator boiled for ten minutes are used, the grit is finely crushed and sifted granite, the charcoal is fine hygienic granulated charcoal. The mixture is made fresh every day according to the number of chicks to be fed. Since using this diet no more bowel trouble occurred. Dry broad wheat bran was always available for chicks to eat.

Chicken Coops and Cold Brooder Box.

For rearing chickens, I would especially call attention to the pattern known as Philo's Brooder Coops. (See Figure 3.) These are 6 ft. long, 3 ft. wide, 16 in.

high, glass front, and a muslin screen sliding from side to side under the roof. This sliding screen, which is a great feature in the coop, is covered with wire netting. It is also partly or wholly (according to season) covered with muslin. Thus the roof may be propped up open to let the sunshine in, while the muslin screen will remain to moderate the wind and keep the chickens warm, and the wire netting keeps cats, etc., from getting in. The Philo System Book gives full instructions for making the above coop, and also the cold brooder box which is intended for use in the above coop.

For use in England these coops must be floorboarded throughout and raised off the ground, a partition across the centre of the coop, with litter two or three inches deep on the side the cold brooder lives, and earth four inches deep on the other side of the partition.

A Philo chicken coop 6 ft. by 3 ft. (see Fig. 3) will hold 50 chicks at first; when 2 weeks' old about 25; when 9 or 10 weeks' old, 12 chickens; and 8 or 9 are enough when maturing.

The cold brooder is a most excellent arrangement. It is very simple to make, but correct instructions must be carefully followed, and it must be properly manipulated. The quilt must be porous, and it must rest actually on the chicks or they would not be warm enough, at any rate at first. It is convenient to have several quilts so as to allow of airing them. One quilt should be extra light for hot weather, or to use in addition in very cold weather. If a door is fitted it should be of perforated zinc, as it must allow of ample ventilation.

The whole idea is Mr. Philo's, so I do not give any instructions for making the cold brooder box. The particulars are given in Mr. Philo's book and I strongly advise that people should procure one of his books before attempting to make one. My reason for saying this is that I have seen a description of a cold brooder evidently on Philo's principle, but to my mind it contained two great mistakes, which seemed to show that the author did not fully understand the working of it. Also I know of a case where a lady made a cold brooder from a hurried description somebody had given her, the result being that she lost a whole brood of chicks.

Making a Quilt.

For those who get a copy of the Philo System Book and wish to make their own cold brooders a few words may help as regards making the quilts. First, if you use cotton wool wadding remember to tear off the paper backing or the quilt would not be porous, which would cause much trouble. For an 18 in. square brooder we found the easiest way to make the quilt was as follows: Buy some of the cheapest muslin, also half a pound of the cheapest loose cotton wool, from a draper. (Do not buy wadding, as the loose stuff is easier to arrange, and cheaper. Make a muslin bag 22 in. square. Put the cotton wool inside and sew up the opening. Lay the bag on a table and work the cotton wool so as to get it an even thickness everywhere. When this is done, put in many pins, about three or four inches apart, to keep the cotton wool in place while you do some rough quilting, after which the pins can be removed. Owing to the quilting the size of the finished article will be reduced to but little over 18 inches, and it will be such that if held tightly over the mouth you will find you can comfortably breathe through it.

Rain Screen for Chicken Coop.

(See Diagram 10.)

A muslin screen, enabling the Philo chicken coops to be left well open even on wet days has been devised by Mr. C. A. S. Hannaford, manager of the Hamworthy Poultry Farm. This screen, though simple to make, is a real boon, as it does away with the necessity of partly shutting down the lids of these Philo coops when a heavy shower comes on. The screen is a frame of wood ($1\frac{1}{4}$ in. by $\frac{7}{8}$ in). It is the length of the coop and 9 or 10 inches wide, and is covered with common muslin. This screen is not attached to the coop, but only to the sliding screen, being hinged close to the front side of it.

To use it, the lid of the coop is raised about 18 in., the rain screen is hinged up nearly vertical, and the lid is lowered to rest on the upper edge of the rain screen, thus giving the coop a sort of gable roof, which runs the rain off both sides yet allows the sun and air to pass through the muslin. As regards the open ends of this gable roof, rain generally comes from the west and the chickens' bedroom is also generally at that side, so a piece of felt may be nailed along the end of the roof lid to hang down and keep out any wet. No felt is necessary for the east end.

At night this rain screen can be folded down flush on to the sliding screen.

When opening the coop to get at the chickens, as the sliding screen is pushed to one side the rain screen, being hinged on to it, travels with it.

The muslin will keep the rain out much better if it is nailed to the upper side of the frame rather than the under side, and this holds good in all cases of using muslin for windows, etc. It looks more tidy if on the inside, but the water then soaks through at the bottom. If the rain be found to run down the screen and into the side of the coop, a strip of wood or felt, etc., can be attached to the edge of the frame so as to carry the water clear of the coop wall.

CHAPTER VII.

SICKNESS.

Prevention of Sickness.

Prevention being far the best, take every precaution to avoid sickness in the way of good management and feeding. If possible avoid mixing new purchases with your live stock until after two or three weeks' quarantine. Pigeons are said to be the worst carriers of disease among birds. Sparrows also carry disease, but more particularly lice. Dogs are said to carry infection. If the ground becomes infected it should be given a good coating of lime, or be thoroughly saturated with a 5 per cent. solution of carbolic acid some days before it is dug over. Growing a crop helps to purify the earth.

If a fowl should go sick take action at once and if possible isolate it. If you have no reference book or fowl medicines at hand try to find out which set of the fowl's organs are wrong (breathing, digestive, etc.) and treat as you would a human being, but giving, say, a quarter of a man's dose for a full-grown fowl.

Medicines.

Do not wait to buy medicines until the fowls have gone sick, but get a small selection and keep them handy. Get the following, or at any rate some of them:—

Castor oil.
Epsom salts.
Permanganate of potash.
Sulphate of copper (powdered).
Sulphate of iron (powdered).
Two-grain pills of quinine.

Cyllin, which is a sort of improved carbolic acid, and safer to rub on to animals.

Vaseline, this with one small drop of cyllin added is excellent for cuts and wounds. Vaseline is also useful as a medium to mix up pills in case this is required.

All these medicines should be bought of the veterinary grade of pureness, as that is quite good enough and much cheaper.

Unless something specially valuable it is rarely worth continuing to doctor a fowl for more than a fortnight; they are not likely to repay any further trouble, and killing seems more profitable.

Hospital Coop.

It is most desirable to have a small, well-lighted, warm, comfortable coop to use as a hospital. When a bird goes sick, if she is at once removed to hospital and dosed she is much more likely to be well again in a day or two than if left for a few days and then doctored; she is also less likely to pass her complaint to the other fowls. Do not, however, let your hospital become a medium for spreading sickness form one lot of fowls to another. For this reason, in case you have more than one pen of birds it is better to convert a few packing cases into hospital coops, so as to have a separate hospital coop for each pen of fowls.

These may be arranged as follows:—Lay the packing case on its side, cut a perch of suitable length, under its ends nail cross-pieces to it to support it and keep the perch 1½ in. clear of the floor. You then have a removable perch. Make a rough frame of wood to cover the front, nail a few bars across this frame 2 in. apart; if cold weather, also cover frame with muslin. Arrange three or four cord tiers to tie frame to the box. Paste calico or paper over any cracks in the walls.

To use this coop always have some newspaper over the floor under the perch; it is much less trouble to change the newspaper than to scrape the coop out. If no outhouse is available, this coop can stand out of doors on four bricks with a piece of linoleum over the top to keep rain out. A single bird in such a coop by himself in cold weather should have a sack over it to help keep him warm.

Any coop used for sick birds must be kept absolutely clean and be often disinfected.

How to Hold a Fowl While Giving Medicine.

The following is a convenient way (for a man) to give medicine to a fowl:—Hold fowl under left arm, getting her well up so that upper arm and elbow hold the fowl. With fingers and thumb of left hand open mouth and give medicine with irght hand. If a box or something is handy on which the left foot can be raised it makes it much more comfortable, as part of the fowl's weight can come on the left leg above the knee, and the fowl is also more comfortable, unless she kicks badly.

Of course, giving physic in the drinking water is much less trouble than in the form of pills, etc.

Disinfection.

So as to destroy all infection in the fowl house from animal and vegetable parasites, including microbes, etc., Professor Salmon recommends that disinfection should take place at least every six months, either by painting the whole of the inside with a hot limewash to which ¼ lb. carbolic acid per gallon has been added, or if a spraying mixture is preferred, he strongly recommends Formaline (formaldehyde) in a 3 to 5 per cent. solution. After spraying, all doors, windows, etc., should be left closed, to enable the vapour to penetrate all crevices.

Cheap formaldehyde may now be purchased as a 40 per cent. solution. One lb. of this solution diluted with one gallon of water gives a spraying mixture of about the proper strength.

To Burn a Fowl.

To get rid of a dead diseased fowl, burning is much safer than burying. If a rough saucer is made with several thicknesses of newspaper, the bird placed in this and a fair amount of kerosene be poured gently all over the fowl it will burn away without much trouble.

Epsom Salts.

In hot summer weather I would give all fowls Epsom salts once a week in their drinking water, about two teaspoonsfull slightly piled up to the quart. And at other times of the year occasional doses as desirable. The cheap grade of unrefined Epsom salts is quite good enough for this purpose.

Permanganate of Potash.

If there is any sickness about, or if the weather is treacherous, it is well to at once begin "pinking" the drinking water with permanganate of potash. The simplest way is to get an empty whisky bottle, put in 1 oz. permanganate, fill with water and shake up. This strong solution should be added to the drinking water so as just to give it a pink colour. As the bottle gets empty it can be filled up again until all the permanganate has dissolved. As such a strong solution stains the hands, it is worth while buying a special bottle with a lip, such as is found in a stone ink jar. Permangate helps to save the birds from catching cold, diarrhoea and other troubles due to minute animal and vegetable microbes.

Unless given very strong it is perfectly harmless. In case of a tear from a cockerel or a rusty nail it is an excellent thing to bathe one's hand in. For this purpose, or for washinganything, a solution of four to six grains to one pint of water is quite strong enough. If used very strong it causes a stain which takes several days to wear off.

One oz. permanganate to 20 ozs. (1 pint) of water gives a saturated solution (of course, any mixture in which all the grains will not dissolve is also saturated). One teaspoonful of a saturated solution thus gives you practically three grains of permanganate, so this forms an easy way of measuring when some accuracy is wanted.

To get an idea of the colouring wanted for "pinking" water, add one teaspoonful of saturated solution to 1¼ or 1½ pints of water. This gives you a ½ or 2/5 per cent. solution, which, I am told, is quite strong enough as a preventative when sickness is about, and that even as weak as one teaspoonfull to 2½ pints would usually suffice.

As slightly pinking the water is so harmless to the fowls it is rather apt to bring this treatment somewhat into contempt, but whenever any contagion is about it is really desirable to pink the water. In India when any cholera was about the wells were always pinked and the results considered most satisfactory. Also during some recent tests in Germany permanganate of potash proved one of the most efficacious destroyers of the spore of fungus growths. Thus as it is harmless to man and beast unless used too strong, permanganate of potash is a really valuable ally in preventing and even curing sickness.

To get a saturated solution of permanganate of potash, allow 1 oz. crystals to 1 pint water and give one hour for it to dissolve.

One teaspoonful of this saturated solution will contain 3 grains of permanganate of potash.

Two teaspoonsful to one pint of water is sufficient for washing any bad cuts or tears.

A vessel or tank filled absolutely full of a solution 1 to 500 (say 1 oz. to 3 gallons, well stirred and dissolved) and allowed to stand for one hour should be cleansed as regards any infection in it.

Household Remedy for Cuts, or Lumbago, etc.

Acetic Acid.

A safe but very healing remedy for cuts and wounds on fowls or human beings, and also for use as a rubbing solution for lumbago, etc., is often available when there is nothing else handy, namely, white wine vinegar, the fundamental principle of which is acetic acid.

For bathing a wound it should be diluted until it tastes only slightly sour. It will not heal tender places if put on strong enough to irritate, but should only have a comfortable warming effect. When used for lumbago, etc., mix white wine vinegar and hot water half and half, sponge off copiously and dry briskly and follow by rubbings with pure, hot olive oil. Many people for lumbago, etc., rub in much stronger solution of acetic acid than the pure vinegar would be.

Acetic acid may be bought and a solution made for keeping, as being safer for "leaving about" than carbolic acid would be. This suggestion emanated from Dr. E. W. Mayell, of Windsor, Ontario, who sent it to the "Poultry Review." A chemist informs me that a solution of 4.27 per cent. of pure acetic acid is what is commonly known as white wine vinegar and is much used as one of the ingredients in home-made cough mixtures.

Signs of Health in Fowls.

The general signs of health are bright eyes, glossy plumage, alertness, activity, good appetite; the comb should be bright red in cocks, and also in the hens when they are laying. The fowl's comb is generally the first thing to inform you of ill-health. The droppings of healthy birds are usually firm, very dark and tipped with a white paste, which is the urine.

Be always watching your fowls, especially the above points, so as to obtain the earliest information of anything going wrong.

If a valuable hen appears to be unwell and you can find absolutely no cause—lice or anything—give her a dose of castor oil and leave her alone; this will often put her right.

Some Common Ailments.

Colds (page 188).
Diarrhoea (page 193).
Diarrhoea in chickens (page 194).
Liver troubles (page 194).
Crop-bound (page 196).
Sour crop (page 198).
White comb (page 198).
Chicken-pox (page 198).
Cramp (page 199).
Leg weakness in chickens (page 199).
Worms (page 200).
Scaly legs (page 201).
Egg broken in oviduct (page 201).
Egg-bound (page 202).
Soft-shelled eggs (page 202).
Laying two eggs in one day (page 202).
Egg-eating (page 203).
Feather-eating and pulling (page 203).
Frozen comb (page 205).
Irregular moulting (page 205).
Lice, etc., on fowls and chickens (page 206).
Delicate chickens (page 206).
Gapes (page 207).
Croup in chickens (page 208).

Colds and Roup.

There are two sorts of colds, and though both are contagious, one is known as Simple Catarrh and the other as Infectious Catarrh, or Roup.

The first symptoms of both are alike.

Symptoms of Simple Catarrh.

Birds are more or less dull, disinclined to move, less or no appetite, difficulty in breathing, watery eye; soon a watery discharge from the nostrils appears, and this gradually gets thicker and glutinous, the eyelids swollen and may be glued together. In very bad cases the birds appear to be asleep, their coats staring badly, breathing is entirely through the mouth and with a wheezing or snoring, or rattling sound; the appetite is entirely lost; a thin liquid escapes from the mouth and the bird soon becomes exhausted and dies.

Symptoms of Contagious Catarrh, or Roup.

The first symptoms of roup are very much the same as in simple catarrh, but the dulness and prostration are usually greater and there is often a peculiar offensive smell, which are valuable points to help form a decision. Usually, also, the watery matter more quickly becomes glutinous and cheesy, the symptoms advance more quickly, the comb and wattles becoming dark red and the wings pendant.

Causes of Simple Catarrh.

Undue exposure to cold, damp or draughts, overcrowding and insufficient ventilation. It is most often seen in filthy and damp houses, with cracks in the walls allowing of draughts. The birds most affected are those who have been weakened by bad feeding, or lack of exercise, or by the attack of parasites, and once it appears it may easily pass on from one fowl to another. Overcrowding is a very frequent cause.

Causes of Roup.

Infection from other fowls or from the ground or coop they live in. Simple catarrh cannot develop into roup unless the contagion of roup is present. It is for this reason that it is so important to be most careful when introducing new birds into one's flock, and in such cases isolation for two or three weeks is desirable to ensure they have a clean bill of health. Roup is most contagious and spreads very quickly. Birds dying of it should be buried deep. A bird not in vigorous health is, of course, less able to escape the disease when contagion is about.

Treatment of Colds.

Simple catarrh is best prevented by good general management. If it appears, examine the fowl house for draughts, using a naked candle, so as to see the flicker; also close the door and shutters, as for night time, and then move the candle along the roosting perch. This may easily discover to you some crack or opening which requires closing up and which otherwise would not be noticed. In some cases a curtain of thin sacking or muslin may convert a draught into wholesome ventilation.

As treatment to the birds, give stimulating food with a little mustard mixed into it. If possible place the affected birds by themselves in a warm coop.

As a preventative to its spreading, and also as a mild form of cure, the drinking water may be just pinked in colour with permanganate of potash.

A simple cure is to dissolve powdered sulphate of copper in the drinking water; the proportion is about 36 grains to two quarts of water. As a rough measure, a teaspoon loosely filled and struck off level holds 48 grains, so that three-quarters of this amount would be about 36 grains.

If the colds are very slight, I should begin with a weaker solution than above, and in bad cases use it twice as strong.

As a general rule onlygive it every other day, or for two days and then a day off; on the off days pink the drinking water with permanganate of potash. A saturated solution of sulphate of copper is obtained by 1 oz. copper to $1\frac{3}{4}$ ozs. of water. One teaspoon of saturated solution contains 17 grains of sulphate of copper. In powder form it would dissolve in twenty minutes.

Sulphate of copper, I am told, has very astringent qualities and acts in that way on both the fowls' breathing and digestive arrangements.

I have read that both sulphate of iron and sulphate of copper should not be given in metal vessels unless enamelled. These chemicals certainly turned my zinc troughs black, but though I have frequently used zinc troughs for this purpose I do not know of any ill-effects caused by the zinc. A chemist, on working it out, told me it would take a very long time for such weak solutions to eat away much metal, but no doubt, if available, earthenware or enamelled vessels are preferable for the purpose.

If a valuable bird caught cold, I should at once place him by himself in a small, comfortable, dry, warm, airy coop, give him a two-grain quinine pill and sulphate of copper in his drinking water and feed with bread moistened with hot milk and a little mustard (as much as he likes) mixed in it. For the next three days I should continue the same treatment, except that after two days of sulphate of copper I should give a change by pinking the water instead.

A remedy for colds, said to be effective and convenient, is as follows:—Keep a spring oilcan, such as is used for machinery, full of kerosene oil, and when a fowl shows the first signs of a cold squirt a little kerosene into the nostrils, mouth and down the throat.

For a very bad cold, I should mix a strong solution either of sulphate of copper or of permanganate of potash (keep it in a bottle), pouring out a cupfull when required. Give the bird two teaspoonsful down his throat and then hold his head under for a second or two to make sure of the mixture getting well up his nostrils, etc. Wipe the head dry and force a little bread and milk down his throat. Repeat this morning and evening.

If a syringe is available, instead of as above, squirt some of the mixture down the throat, nostrils, mouth, eyes and cleft of palate.

If sulphate of copper is used, 100 grains to one pint is the strength, or roughly two teaspoons loosely filled and then struck off level to one pint of water. As this is really strong it may be preferred to use a mixture of three-quarters that strength to begin with. If permanganate of potash is used, 20 grains to one pint is the strength, or roughly seven teaspoons of a saturated solution to one pint of water. It is, of course, essential to keep up the bird's strength with food.

Aconite for Colds.

A cure for a bad cold and cough, with difficulty of breathing, is given as follows:—

Aconite is placed in the drinking water, four drops to the pint, and even stronger. A very weak bird may have some mash which has been moistened with this water, forced down her throat with great advantage.

Mr. M. C. Schraer, of Pennsylvania, speaking of this recipe, says that in three years every bad case has yielded to this treatment in about 48 hours.

Treatment of Roup.

Any bird that has ever really had roup is undesirable in a utility breeding-pen. It is therefore best to destroy it and expend all available energy in isolation of any birds having colds, in disinfecting work and the prevention of contagion. All fowls that die should be buried deep or burned. The coops they have been treated in should be burnt or else most thoroughly scrubbed with boiling water and disinfectant. If the disease is considered to have been brought in with some new bird the outbreak will be felt as a lesson for the future to be more careful and isolate all new comers for two or three weeks. Also never go near a neighbour's fowls if they have roup and so risk your carrying the contagion back to your own birds.

Remember that the better health and the more vigour your birds have the less the chance of their being affected by roup should contagion be about.

Do not destroy a bird for roup because the first person who sees it says it is roup. Roup is the word used by many people for an ordinary cold. Think of the roup mixtures advertised which effect a cure in three days! I should not care to kill a bird as having roup unless he smelt pretty strong, as that and the cheesy matter seem the pryincipal indications.

Diarrhoea in Fowls.

Probably result of irritation from improper food, or may be caused by a chill or continued damp.

In very mild cases give Epsom salts.

In mild cases, give sulphate of iron mixed in the drinking water; the dose is 1 to 2 drachms to each pint of water (*i.e.*, from $\frac{1}{4}$ to $\frac{1}{2}$ oz. per 2 quarts of water). A saturated solution is 1 oz. of iron to $1\frac{3}{4}$ ozs. of water. This would dissolve in 10 minutes. One teaspoon of this would contain 34 grains, *i.e.*, about half a drachm.

For a valuable bird give at once a teaspoon of castor oil, also three times a day give two grains of subnitrate of bismuth and one grain of carbonate of soda, getting it mixed at a chemist's. Give him boiled milk instead of water to drink, keep dry broad bran before him all day, a small ration of soft food or bread and milk and small ration grain.

As regards dieting a flock, give no wet mashes unless in form of rice boiled in milk. Keep dry bran always before the birds, give boiled water to drink, with some oatmeal stirred in. Indian corn sometimes effects a cure.

If severe diarrhoea with bloody discharge occurs it is probably dysentry, and best to kill the bird.

Diarrhœa in Chicks.

For diarrhœa give one or two meals of plain hard-boiled eggs and give nothing to drink but scalded milk. Powdering part of their food freely with charcoal often helps.

If chickens have diarrhœa and are really off their feed, one or two drops of castor oil may put them right in a very short time.

Chicks who during the first three or four days have hardly any water and all their milk scalded are said to be less likely to get diarrhœa later on.

Absolute cleanliness is a great safeguard against diarrhœa. Frequently scald all feeding boards, troughs, and drinking vessels. Occasionally put the earth in the run through a sieve so as to take out all the droppings. Never leave any green food to get trodden into the earth and putrefy there. Never give sour soft food. Try "Feeding Chickens to Prevent Diarrhœa," as in Chapter VI.

Liver and Indigestion.

The symptoms may be, moping, purplish comb, watery diarrhœa; in mild cases the comb is sometimes pale coloured. It is often caused by want of exercise, insufficient green food, not enough bran, overfeeding, especially of starchy or oily foodstuffs.

Treatment:—Give more green food, reduce starchy or oily foods, make them dig, give Epsom salts. For valuable birds, give a teaspoon of castor oil and follow with any good liver pill.

If fowls appear generally "not fit," and perhaps the combs rather pale, it is very often all due to overfeeding; in fact, they are liverish. Watch them in the morning to see if even then they do any digging. Examine the litter, may be it is full of grain and digging is quite unnecessary to get at it. Give Epsom salts and as much green food as they will eat; give only dry bran instead of any mash; give no grain at all until they have cleared every bit out of the litter, and then give only half the former grain ration, or less, until they get really anxious and dig freely. Of course, grit must always be before them, but in this case I should also keep charcoal before them, broken in pieces, the size of one or two peas. It is best to buy the charcoal specially prepared for poultry. When they recover, readjust your feeding scale, give no more food than what they will eat as if famishing. As regards grain, never let the litter get full of it. Try and get small-sized grains; an ounce of millet gives about six times as much work as an ounce of wheat. Cut the grain ration down. When in health, except for half an hour after their green food and perhaps three-quarters of an hour after their soft food, should you at any time during the day throw a few grains in the litter the fowls ought at once to dash in pursuit of it; but at night when they go to roost they should have arrived at repletion, but not till then.

Overfeeding and want of exercise is the chief cause of trouble among the great majority of fowls excepting those loose on a farm who have to find their own food.

The following is a good pill for liverish fowls:—Rhubarb, 4½ grains; sulphur, 4 grains; gentian, 4 grains; aniseed, 2 grains; ginger, 2 grains; liquorice, 2 grains. Dose, one pill daily for three to six days. If you propose to mix them yourself, get the chemist to supply 32 or 64 times those quantities in powder form. Mix all well together and with the aid of veterinary vaseline work them into a stiff lump of paste. Cut this up into 32 or 64 pills. They keep better if well rolled in flour and kept in a tin box; 32 or 64 are convenient numbers, because it always means halving the lump of paste instead of dividing into three or five, which is more difficult.

Whenever a fowl dies and liver is suspected as the cause, the bird should be opened. The liver will probably be found discoloured, which is not serious, but if the liver is found to be covered with white spots, or nodules, from size of a pin's head up to $\frac{1}{8}$ in. across, then the bird should be packed up and sent to a specialist for examination. Probably he will report that it is tuberculosis, and he may advise you to destroy all sickly birds in that pen before it spreads further.

Cropbound.

The crop gets distended as if it contained a hard ball, and the food can get no further. It is often caused by the fowl eating tough, wiry grass, which all tangles together inside the crop. It may be due to a feather or something stopping the opening leading down from the crop. In the morning all the crops should be empty, so that any bird with a full crop should at once be caught and examined. Often the first thing to catch your eye will be that a bird looks unhappy, and its eyes have a fixed, strained appearance.

Treatment.—Pour several spoonfuls of olive oil down the throat, then kneed the crop well but gently. Hold the bird upside down, and try to gently force and kneed the contents of the crop out through the mouth.

If the crop cannot be emptied this way it should be opened and cleared out. This operation is a very simple one, but do not wait until the fowl becomes exhausted.

Have ready a sharp pen knife, something such as the handle of a small salt spoon, a weak solution of cyllin or carbolic acid (say, 1 per cent.), three or four needles ready threaded with white silk or wool, or even cotton. These should all have been dipped in the carbolic solution. Also have warm water and a towel ready; also a little warm milk and a teaspoon. If you can be sure of using them carefully a pair of thorn tweezers may prove useful to get a first grip of the grass stuff you may find tangled inside.

Get someone to hold the fowl for you on a table, cut feathers close off rather to one side of the front of the crop. Carefully cut through the outer skin a vertical slit about 1 in. long. Press outer skin across a little so that you can get at the inner skin at the front of the bird, and make a vertical slit about ½ in. long, or even 1 in. if it proves necessary. Pour some olive oil through this opening into the crop, and gently kneed it. Then with tweezers or fingers or saltspoon handle, gradually and very carefully work out the contents of the crop, adding more oil as required to loosen it. When the crop is empty feel round inside with a small finger and make sure the opening into the tube leading down from the crop is clear. Wash out the crop with the carbolic lotion, pour in some warm milk, sew up the inner cut into the crop, afterwards sew up the outer skin.

For twenty-four hours give no food except water just pinked with permanganate of potash. For next one and a-half days give only milk. For next four and a-half days bread and milk, and after that their usual food. It is not necessary to take out the stitches: they will disappear gradually.

Mr. Philo considers that chickens over two weeks' old can be safely operated on, but they ought to have a little olive oil given them after the operation.

The allowance of stitches is four or five to the inch, and, of course, each stitch is tied separately. When selecting the place to make the cut try to avoid any big veins; these can be seen fairly easily. When you press the skin across so as to make the inner cut it only requires to go a very little way. For a first attempt it might be easier to make the inner cut under the outer cut, and not to one side of it. Also, if it is found too difficult to sew up the cuts separately, they may both be sewn up together, but doing it separately allows of its healing rather quicker

Sour Crop.

Owing to indigestion the crop gets full of a sour-smelling liquid. Hold the bird upside down and gently kneed the crop; the liquid will come away through the mouth. Mix some baking soda in water, 1 part to 8 parts, pour two teaspoons of this down the throat, give light feeding with plenty of green food and dry bran and water, and for next three nights give a one grain quinine pill.

White Comb.

Sometimes called "Baldness," its proper name is "Favus." This commences as small white scurfy spots on the comb, which gradually increase in size until the comb is all a dirty white. If not cured it may extend all over the head, making the bird as bald as a vulture and eventually kill the bird, though in its first stages it does not seem to affect their health. This disease is a fungus growth; it is very infectious, but easily cured if treated at once.

Treatment.—First of all pink all drinking water to help prevent the disease from spreading. Rub scurfy spots well off with something blunt so as to allow the ointment to get well into the skin, but do not cause bleeding. Then rub in a preparation of cyllin or carbolic acid 1 part, soft soap 20 parts, well mixed together. For the next few days continue daily to rub in this ointment. Professor Salmon, in his book, gives also stronger preparations, which would be necessary in advanced cases.

Chicken Pox.

Also known as Pigeon-pox or Sore Head. It appears as small yellow nodules like warts varying in size from a pin's head to a grain of wheat. After ten days these nodules burst, and a watery discharge issues. These warts appear chiefly on the head. Though called chicken pox, it is not related to cow pox, but is quite a different disease. It is a fungus growth, most common in warm countries and in damp houses. It is contagious, and the roosting place becomes infected and must be thoroughly disinfected. All drinking water should be pinked with permanganate of potash. It chiefly affects young birds, and usually kills them unless treatment is given.

Treatment.—Soften the crust of the scabs with warm water, and apply carbolic ointment or a solution of sulphate of copper (1 drachm to ½ pint of water); or, simpler, rub off the crust of the scab and rub with half a lemon on which you have put some salt; this will dry up the sore, but the disinfection must not be forgotten. This remedy (lemon) was produced by "Jim," who is one of Mr. Philo's men on his farm in Florida.

Cramp.

If leg weakness appears in adult fowls it may mean rheumatism from the damp, in which case their legs may be rubbed with 1 part turpentine and 3 parts olive oil well shaken together in a bottle. (This mixture also gives excellent results for human beings.) The legs should then be loosely bandaged, and the bird kept in a warm, dry place for a day or two. If the leg weakness is due to lack of vitality, but it is desired to keep the birds, they may be given a teaspoon twice daily of Parrish's chemical food and cod liver oil mixed—half and half.

Leg Weakness in Chicks.

1. May be a bruise or injury to the foot which wants attention.
2. May be due to excessive heat in a heated brooder.
3. May be cramp from living on bare boards.
4. May be a form of rheumatism.

5. May be they have grown too quickly for strength of their legs.

6. It may be an obscure form of indigestion from overfeeding.

Once you are accustomed to cold brooders the average heated brooder seems a stuffy, unwholesome arrangement.

Chickens should never be kept on bare boards; their toes cannot work and they get cramp.

If they have grown very quickly, and that seems the cause, it appears desirable to reduce the starchy food. Give some raw lean meat and plenty of green food and bran, some Parrish's food, and their milk should be skimmed.

Indigestion and overfeeding is, however, by far the most frequent cause. In this case they should have no meat or stimulating food. Their milk should be skimmed or separated; give bran and green food *ad lib.*, a very little breadcrumbs and milk, and but little grain. Except for bran and green food they should for a day or two be almost starved. People often think that the chickens are weak and want feeding up, but overfeeding is the very thing that has caused the trouble, and the really kind thing is to quickly starve them back to health, but leave bran always before them.

Worms.

There are several varieties which trouble fowls—round worms, tapeworms, etc.

The usual symptoms are diarrhœa. The birds get thin, dull, weak and move stiffly. When diarrhœa will not yield to ordinary treatment worms may be the cause; also when fowls appear generally unwell and no other reason can be found.

For treatment give 2 to 4 teaspoons of oil of turpentine and olive oil mixed—half and half. If necessary two or even three teaspoons of turpentine without the olive oil may be given, but the hens do not like pure turpentine. They prefer male fern, the dose being 15 to 20 drops of the liquid, or, if in powder, from 30 to 60 grains. Give medicine after mid-day, after having starved them all the morning to get the insides empty.

When the droppings board is being cleaned a look out should always be kept for any worms.

Scaly Legs.

The scales just above the foot appear very rough and coarse. The cause is a parasite; it is infectious. The simplest treatment is to get a jar filled with kerosene and raw linseed oil (half and half), and hold the bird's legs in this for a few seconds or more; then squeeze off the surplus liquid and roughly dry. This to be done every few days.

For valuable birds soak the legs in warm and very soapy water, scrub with a nail brush. All this must be thoroughly done so as to loosen and clean the scales. Then dry the feet, then dip them for half a minute or more in the kerosene and linseed oil, then dry off. If thoroughly done, and repeated once four or five days later this ought to effect a cure unless the legs are very bad. Dipping the legs in plain paraffin answers, but the oil helps to hold the paraffin to the leg and reduces the smarting.

When the scaly leg mite gets well established in the the run and buildings he is very difficult to get rid of.

Broken egg in the Oviduct.

Caused by accidents or being hunted by a dog, etc. If a laying hen is noticed standing with her tail tucked well down and generally looking unhappy, it may well be that she has a broken egg inside her, and the remains of the shell and skin of the egg are causing irritation. She should at once be caught and given one or two teaspoonfuls of castor oil to help her throw out the remains of the egg. Sometimes part of the egg shell and skin may be found in the vent and removed. The roosting perch being too high or awkward to get at may cause this trouble.

Egg Bound.

A hen may have difficulty and even be unable to lay an egg. This may be due to irritation or constipation or to her being too fat.

The hen at first goes frequently to the nest to try and lay; she then appears to be in distress; later the plumage gets rough and the hen will not move. If the hen is examined the egg can be distinctly felt.

If discovered before irritation has developed simply inject a little olive oil, and try to work the skin about the egg to get the oil around it.

If this does not succeed hold the bottom part of the fowl in water, as warm as she can comfortably bear it, for half an hour, and then again inject oil and try to loosen the egg.

If this fails a hole must be made in the egg to empty it, the shell be then crushed, and removed in pieces.

Soft-Shelled Eggs.

This may be due to want of lime or defective organs. Presuming oyster shell has been always available, I should give lime water to drink. Give Epsom salts every day for seven to ten days, give plenty of green food and dry broad bran. Allow one teaspoonful of Epsom salt crystals per three hens; this may be mixed in either dry or wet mash.

If a hen continues laying soft eggs it is best to kill her, as it may lead to egg eating among your fowls.

Laying Two Eggs in one Day.

Sometimes a hen lays two eggs in one day. If she continues doing this treatment should be given, or she will come to grief, as the cause is irritation of the organs concerned. Put her by herself in some quiet place for a week or ten days, giving plenty of green food and dry bran and only easily digested food. For the first three days give a one grain quinine pill morning and evening.

Egg Eating.

This is not a disease but a bad habit, and very catching. As a remedy some people leave a lot of china eggs about hoping that the birds may peck hard at them and give up the habit as useless. Some people blow an egg, fill it with mustard, cayenne, Worcester sauce, etc., seal up the holes with stamp paper, and allow the hens to eat a few. I have read of three cures effected by buying up basketfuls of empty egg shells from confectioners, etc., and piling them in a corner of the fowlhouse; these people say the fowls soon hated the sight of an egg. By far the best precaution is to trap nest, which will tell you who is the offender, or else to use Mr. Hannaford's device to prevent egg eating. (See nest to prevent egg eating.)

A cure for egg-eating said to be most effective is as follows:—

Take an egg, make two holes, blow out the white, seal up one hole, carefully break the yolk, fill up with some household ammonia, mix it up with the yolk, seal up the remaining hole. If this is given to the fowls it is said they are cured for a year or more.

Feather Eating and Pulling.

This comes sometimes from disease, sometimes from habit. In either case it is very infectious.

It may be due to idleness, want of exercise, want of animal food; but sometimes stopping all meat cures it. It may be from want of green food, it may be owing to irritation caused by parasites; it is said to often occur if fowls are kept short of water, so this would be an additional reason for keeping cool water always before them. Wright advises adding carbonate of potash to the drinking water sufficient to give it a decided alkaline taste.

If the birds have had no meat it is worth trying raw lean meat. More green food may help, so tie up a whole cabbage high enough to make them jump at it; this also gives exercise and occupation. A change of diet may help; Epsom salts may be tried. An old remedy, said to be effective, was paring down the sides of the beak with a very sharp knife, not to make it bleed, but sufficient to feel tender if a feather is laid hold of tight enough to pull at it.

Fowls kept in close confinement are the most subject to this, while fowls free on a farm very rarely suffer from it, so for confined fowls the best cure seems to be to turn them out loose for a period, or, at any rate, the chief offenders, until they have forgotten the habit. A whole flock may pick up this habit in a short time from one single bird, so it should not be neglected; but the moment it appears the chief offenders should be separated away from the others; if this is not feasible, and only one bird is the real offender, klling seems desirable before the flock is all contaminated.

It is worth doing something to make the feathers nasty to the taste; pull out any small stubs left in and then rub on the bare places and feathers around. A thick lather of carbolic soap or an ointment may be made of vaseline or lard mixed with powdered aloes or paraffin.

I have seen fowls who were confined in a house with earth to dig in but no straw. These birds fought for and eat every feather that came out. In this case it seemed possible that feather eating was at any rate partly due to want of bulky food, for on throwing straw to them they at once began eating it.

Frozen Comb.

Treatment.—First rub it well but very gently with snow. Then dry, and apply an ointment made of vaseline 5 parts, glycerine 2 parts, turpentine 1 part.

Be careful not to rub roughly. Do not bring the bird into a warm room.

Irregular Moultings.

SPRING MOULTINGS—A POSSIBLE CAUSE.

Should any fowls commence moulting in the spring, and this moult take the form of bare patches, it is advisable to at once isolate any affected birds.

Then pull off, say, two or three feathers from each bird from close to the bare patches, being careful not to break off any little scabby scales there may be on the feather near to the end of the quill. Send these feathers to an expert for examination, and if he reports it as a case of *Sarcoptes Lœvis,* I should kill off all affected birds unless they are very valuable indeed. If you decide to treat them it must be done regularly, and kept up for at least six or eight weeks; also all the old litter must be burnt and houses disinfected. They can be cured, but it means every few days rubbing stuff into the birds' skin all over it, and from experience I can say it is not good enough. Sarcoptes does not appear to affect the health of the bird much, but once it is established it means every spring it will break out and the birds will be covered with bare patches and perhaps naked, and be a terrible eyesore. *Sarcoptes Lœvis* is a minute parasite attacking fowls and pigeons. I make this mention of *Sarcoptes Lœvis* because I have unfortunately experienced him. I understood, however, that it is rather a rare complaint.

Professor Salmon gives the following as the principle symptom:—" A loss of feathers from spots of various sizes, situated on different parts of the body. The feathers break off at the surface of the skin, and at the root of the feather is seen a small mass of epidermic scales, which is easily crushed into powder. A microscope examination of this powder reveals numerous mites and the *débris* which they produce." Spring moultings also occur from other causes, especially if the hens have been laying heavily all through the winter.

Irritation from Lice and Mites.

This may easily entirely prevent hens from laying any eggs. It may cause real sickness, and even death.

In cases of obscure sickness either worms or these external parasites may well be suspected.

If hens ought to be laying eggs but do not do so, and their house has not been recently sprayed, it is worth starting a campaign against both lice and mites; but for really good results the war against these pests should be continuous and never entirely cease.

When fowls have pale faces and combs and ruffled feathers, look for lice.

When the feathers of chickens are rough or their wings droop, or their eyes look pale and sunken, and the head and beak looks much too long for the animal, again look for lice; or it may be they have got ticks on their heads. For this dab on paraffin and lard mixed 1 to 2, or paraffin and salad oil. For lice dust chickens over a newspaper to save waste. Dust them two or three times, the second or third time five to seven days after the first dusting.

Delicate Chickens.

Prevention is best, but when your chicks have hatched out it is too late, for real prevention means ensuring that the breeding pens are properly fed as breeding stock, in which case you are far less likely to have delicate chicks. Too great or too little heat in the incubator also causes weakness in the chicks.

If any chickens seem really delicate, kill them; they are not worth bringing up, and certainly would not be desirable ever to use for breeding. It is waste of time and money to feed useless birds, and they are not healthy companions for your other chicks.

Chickens should at once start growing and keep on growing. If they seem to get a check try to find out the cause, and try a change of diet. One or two drops of Parrish's food in a little water often helps them much and strengthens the bones. This may be put in the drinking water; the dose is from $\frac{1}{4}$ to $\frac{1}{3}$ of a teaspoon of Parrish's food to four tablespoons of water, but as a general rule avoid giving medicines to chickens as much as possible. Improper feeding to the parents may make Parrish's food or a little extra meat desirable for the chicks. If weather is bad or any chicks are ailing it is well to just barely pink their drinking water with permanganate of potash.

Gapes.

Caused by small red worms 1/5 to $\frac{1}{2}$ in. long in the wind-pipe. Is most frequent in chickens one to four weeks' old. The chickens stand with wings down, head stretched out, shake their heads as if trying to get rid of something, and they cough and gape every minute or two. As they get worse they cough more frequently. Only very strong chickens or those with very few worms will survive without treatment.

The simplest treatment is 10 drops of oil of turpentine to one pint of their drinking water.

Other treatments are a one-grain camphor pill twice daily, or 1 to 3 grains sulphur twice daily.

One difficulty is that as soon as a chick coughs up a worm another chick eats it.

If only a few chickens have it the worms can often be removed with a long horse hair. Double the horse hair, twist it up, leaving open loop at end; hold chicken's mouth open, dip hair in turpentine, and as chick's throat opens to breathe gently push loop down its throat and twist round a few times. When removing hair one or more worms may be pulled out, or being loosened they may be coughed up. This hair treatment should be done very gently and the hair not be left down too long or the chicken may choke, but it must be repeated until no more worms come up.

A simple remedy for a few single cases of gapes is given as follows:—

Hold the chick's mouth open and blow down tobacco smoke, the stronger the better; do this a few times until the chick almost wobbles on its feet. This kills the worm and it is generally coughed up within a day. It is said that two treatments will cure any case.

In any case all affected chickens should be separated from healthy chickens, and the coops and feeding boards, etc., should be splashed with boiling water or with a 5 per cent. carbolic acid solution.

Burn the bodies of any chickens that die of it. Burn all worms you find coughed up. To clear the ground of this pest, dig in lime or saturate by sprinkling with a 1 per cent. solution of salicylic acid.

Croup in Chickens.

Some correspondence has recently been taking place on this. Several correspondents affirm that chickens do suffer from a complaint similar to croup. In some places, to give children relief, the custom seems to be to warm some vaseline in a spoon and pour it down the throat; this same treatment they also give to their chickens, with good results.

CONCLUSION.

It may appear as if these notes had been written partly with the object of advertising for the benefit of the vendors of various articles. That, however, is not in anyway their purpose, but to try and pass on to others information which it took me a good deal of time and work to pick up for myself.

Many specialists are now working at various poultry questions, and the next few years will probably add considerably to our present knowledge of the subject and it is very possible that alterations will take place in some of the data we now work by.

It may be news to some people to hear that experiments are now being carried on in the way of passing wireless rays of electricity through the coops in which young chickens are being reared. Some of these experiments have been most successful, the chickens when five weeks old being as large as the ordinary non-electrified chickens of eight weeks old, but this part of poultry science is still quite in its infancy.

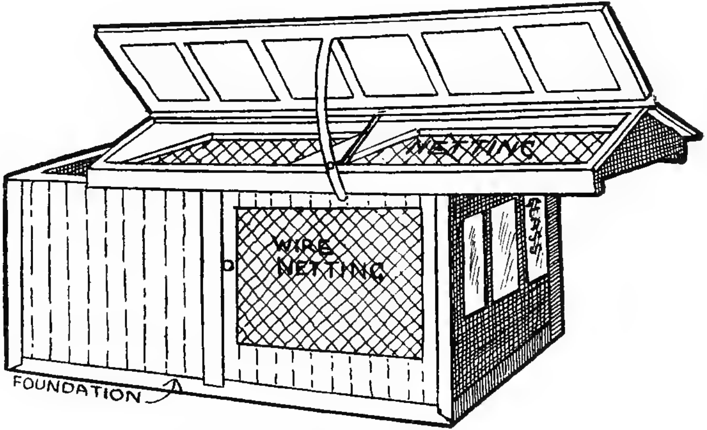


FIG. 1.—THE PHILO ADJUSTABLE COOP.

The roof has been slid partly open to get at the fowls. Half of the roof hinges up for ventilation. The South shutter is pushed back between the double walls and so exposes the wire netting.

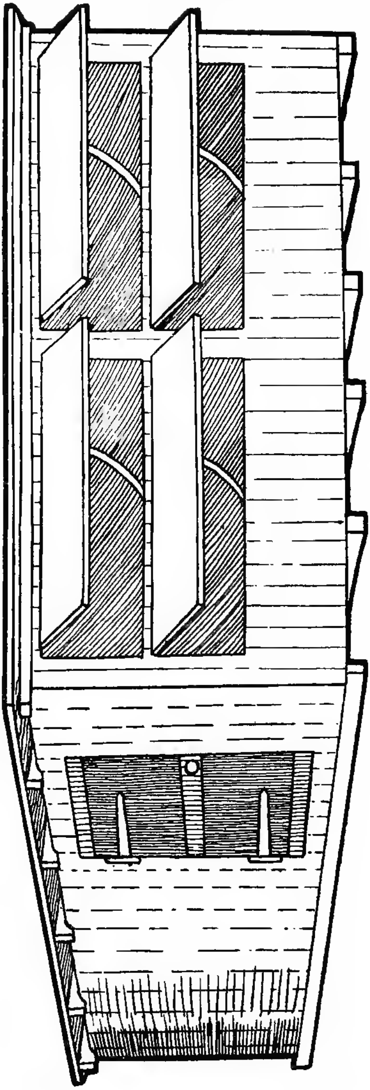


FIG. 2.—A FAVOURITE FORM OF INTENSIVE HOUSE.

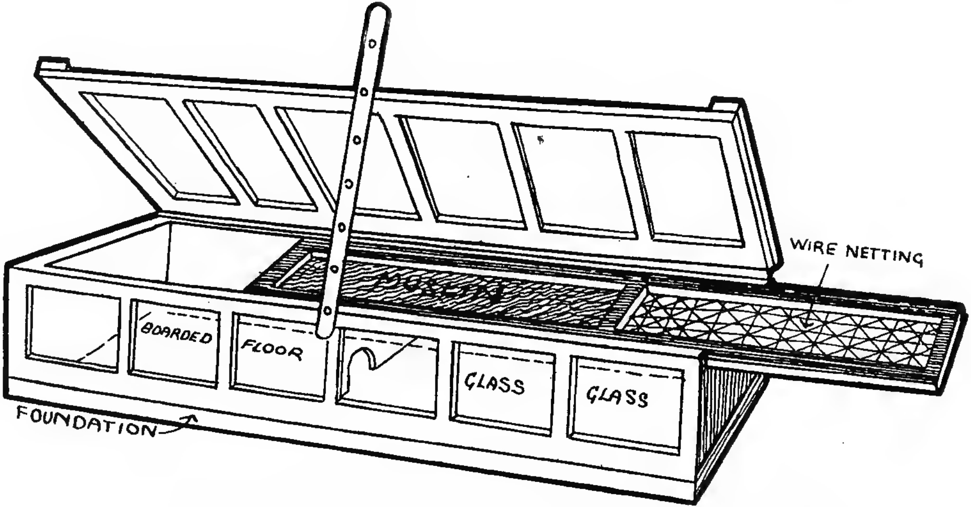


Fig. 3.—The Philo Chicken Coop (6 feet by 3 feet by 16 inches high). Windows along front. Roof propped open. The sliding screen partly open.

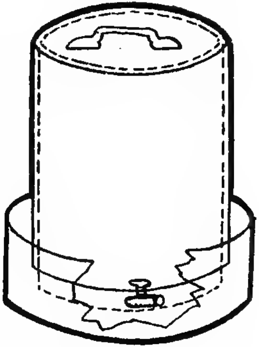


FIG. 4.

TOP FILLING DRINKING FOUNTAIN. — Dotted line shows the inner cylinder which is open at the top. Part of the zinc saucer has been removed to show the tap.

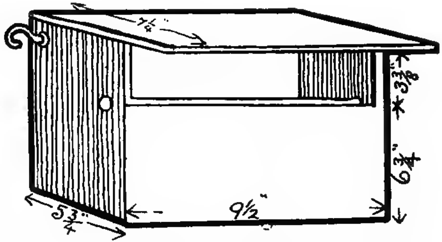


FIG. 5.—BOX FOR FEEDING BRAN OR DRY MASH.

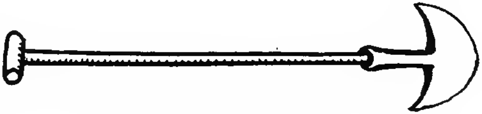


FIG. 6.—TOOL FOR DIGGING IN COOPS.

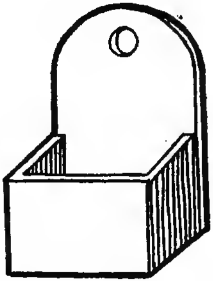


FIG. 7.—GRIT HOPPER.

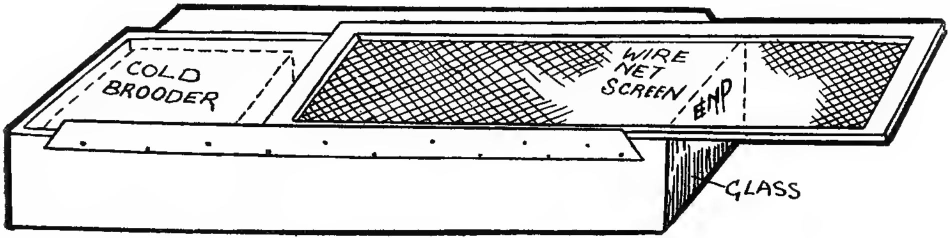


Fig. 8.—Chicken Cabinet for Indoor Use.

About 4 feet by 1 foot 7 inches by 9 inches inside measurement.

The wire top screen is much more convenient if made in two halves.

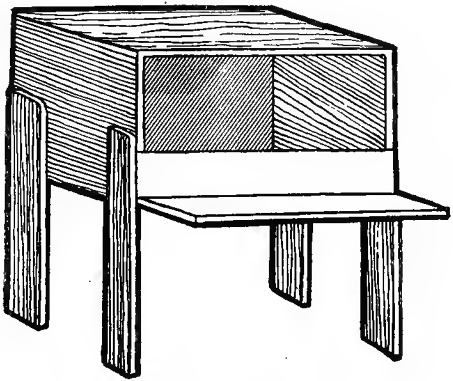


FIG. 9.—DUST BATH.

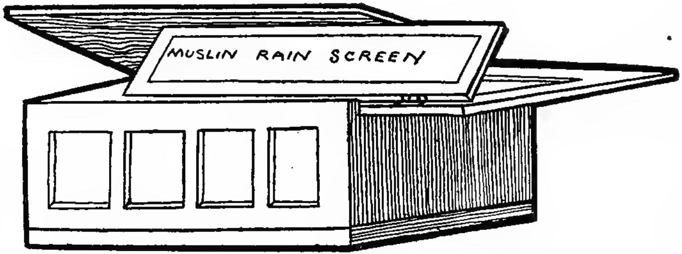
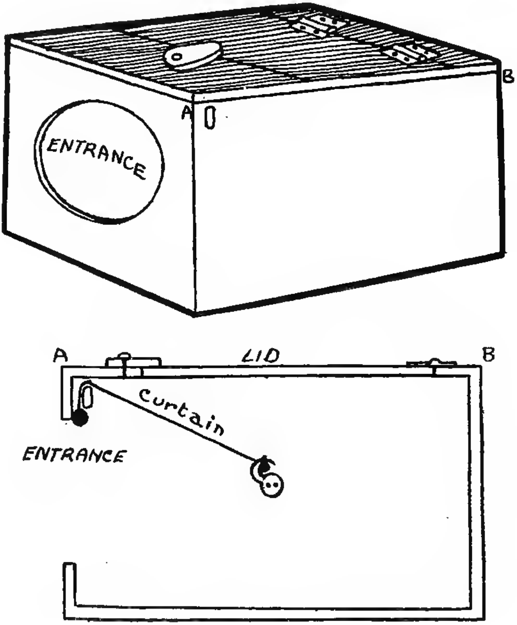


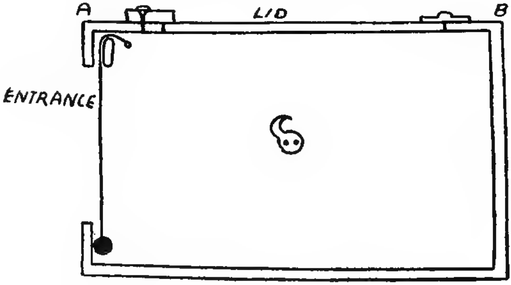
FIG. 10.—A RAIN SCREEN.
Hinged to sliding frame of a chicken coop.

The Sliding Screen is slid partly out to show the arrangement better.

Fig. 11.—Trap Nest.



Section showing trap set.



Trap released and curtain fallen down.

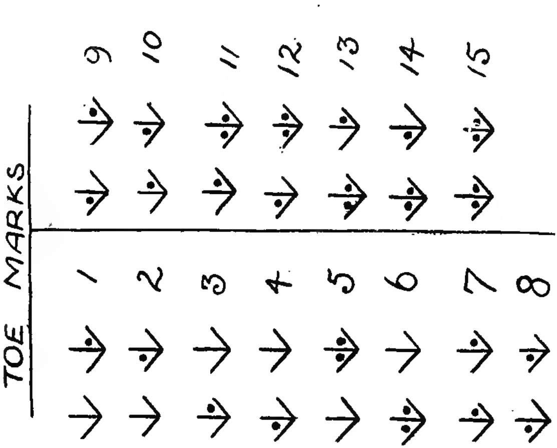


FIG. 13.

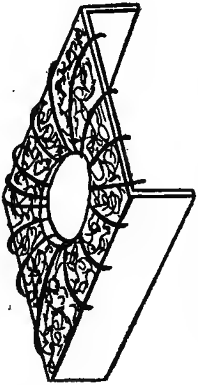


FIG. 12.—EGG-EATING PREVENTER.
To be placed in the nest.

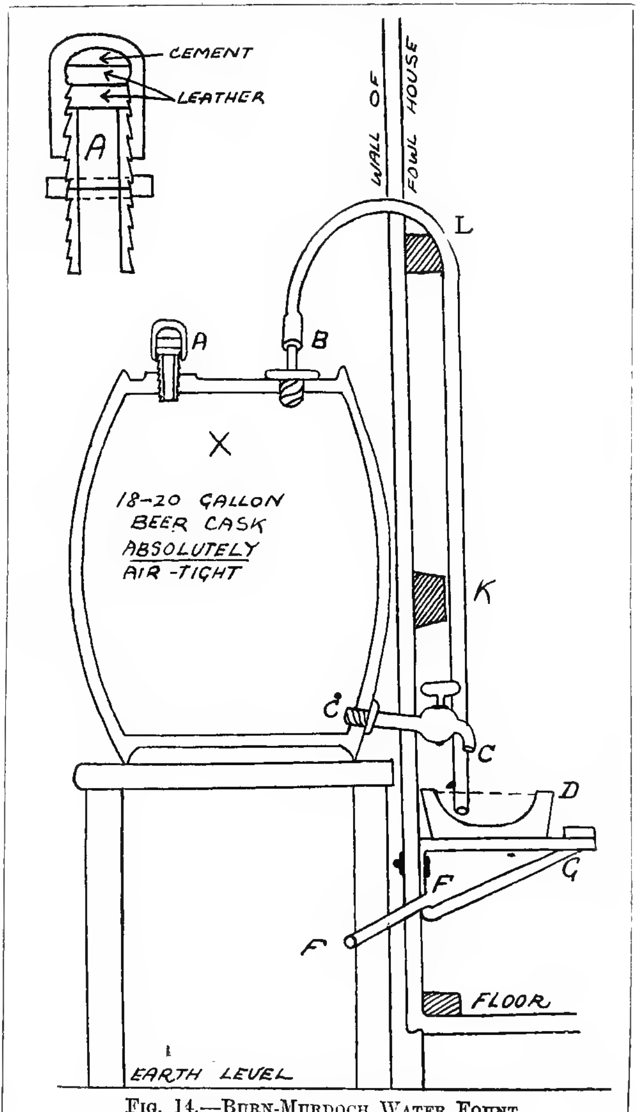


FIG. 14.—BURN-MURDOCH WATER FOUNT.

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